DOGADKIN, B.

IA 2/50T59

USSR/Chemistry - Rubber
Butadiene Rubber
Sep/Oct 48

"Structure and Properties of Filled Rubber Mixtures: III, Mixtures of Sodium Butadiene Rubber With Channel Black," B. Dogadkin, K. Pechkovskaya, M. Dashevskiy, Sci Res Inst of Tire Ind, 12 pp

"Kolloid Zhur" Vol X, No 5, pp 357-368.

Ukhtinskiy channel black as a filler for sodium butadiene rubber was examined in concentrations of less than 20, 20 - 40% in relation to amount of rubber. Found that in concentration of 20 - 40% of the black, structural arrangements were effected

[redacted] 2/50T59

USSR/Chemistry - Rubber
Butadiene Rubber (Contd)
Sep/Oct 48

(threads and small chains). This did not occur for lower concentrations; in concentrations of 40 and above, surplus black did not form additional structural groups but was merely dispersed between them. Rubrax and sulfur retarded process, but mercaptobenzothiazole accentuated it. Stearic acid had no noticeable effect. In all degrees of concentration of channel black, rubber remained a continuous-phase system. Submitted 3 Jan 48.

[redacted] 2/50T59

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Application of infrared absorption spectra to the investigation of the oxidation process of sodium butadiene rubber. B. A. Dogadkin, V. Kasatochkin, N. Klausen, and A. Smirnova (Moskov. Inst. shimnol promishlennosti). *Izvest. Akad. Nauk S.S.S.R., Ser. Fiz.* 12, 616–20 (1948).—Measurements were made with a Hilger spectrometer in the region 2.5–11.3 μ. The receiver was a Bi Ag thermopile. The rubber was investigated as a film 45–50 μ thick cast on water. The absorption spectrum of Na butadiene rubber shows a band near 3.35, caused by CH vibrations, a band near 6.1 μ by C:C vibrations, a band near 6.9 μ attributed to the deformation of the methylene group, and 2 bands at 10.75 μ and 11.0 μ, caused by deformations of the group =C:CH—. Polymers (1) (—CH_2CH:CHCH$_2$CH$_2$CH:CHCH$_2$—) and (2) (—CH_2-CH(CH:CH_2)CH$_2$CH(CH:CH_2)—) can be obtained. The second predominates. The films were oxidized in air at 142–3° for 5, 10, 20, 30, 40, and 60 min. Bands corresponding to the OH and the CO group appear; also bands corresponding to vibrations of —C—O—C— (8.5 μ). Oxygen acts on the double bonds and the appearance of new groups accounts for the change in the properties of Na butadiene.

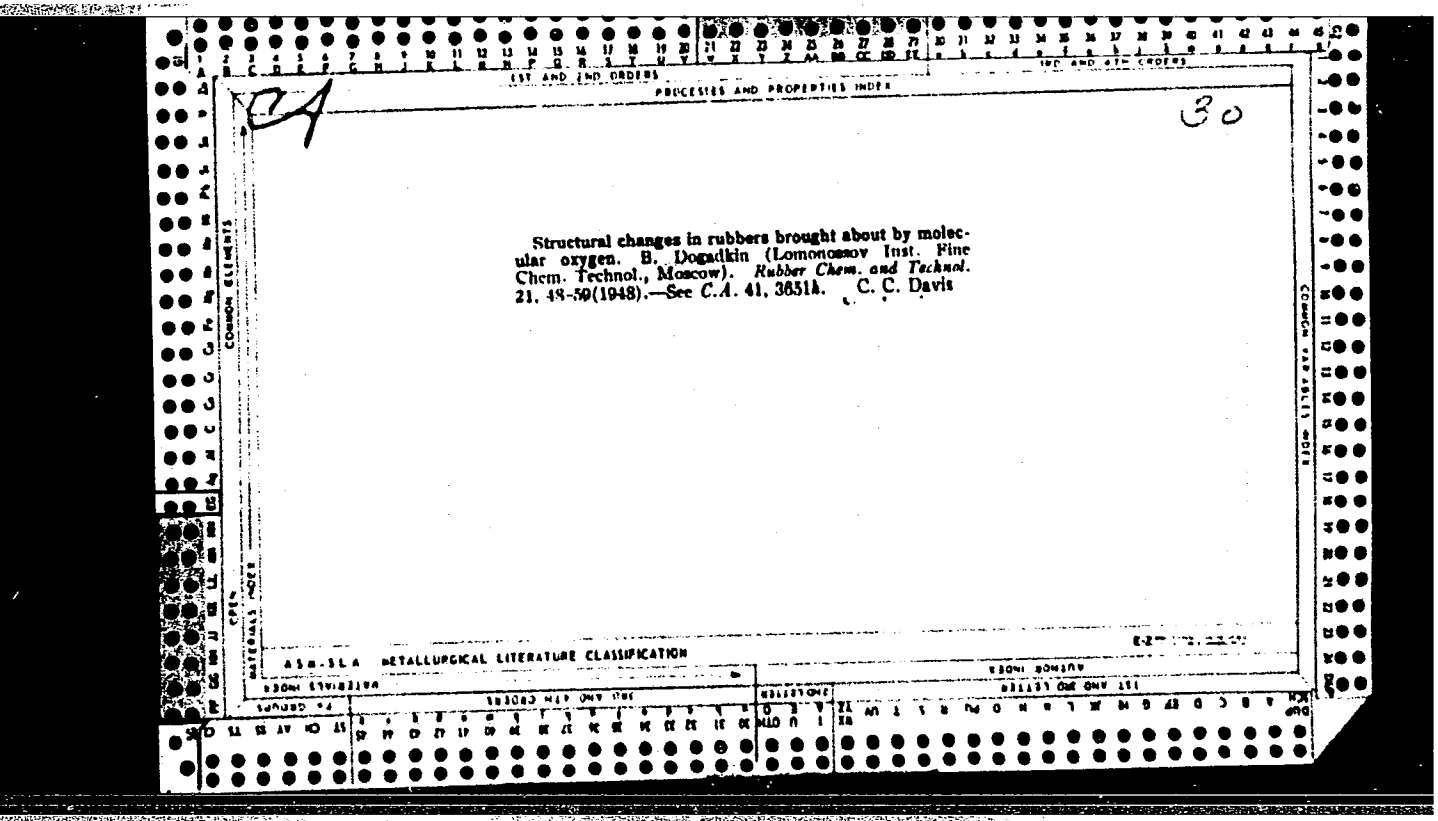
S. Paksver

Rubber Abstracts

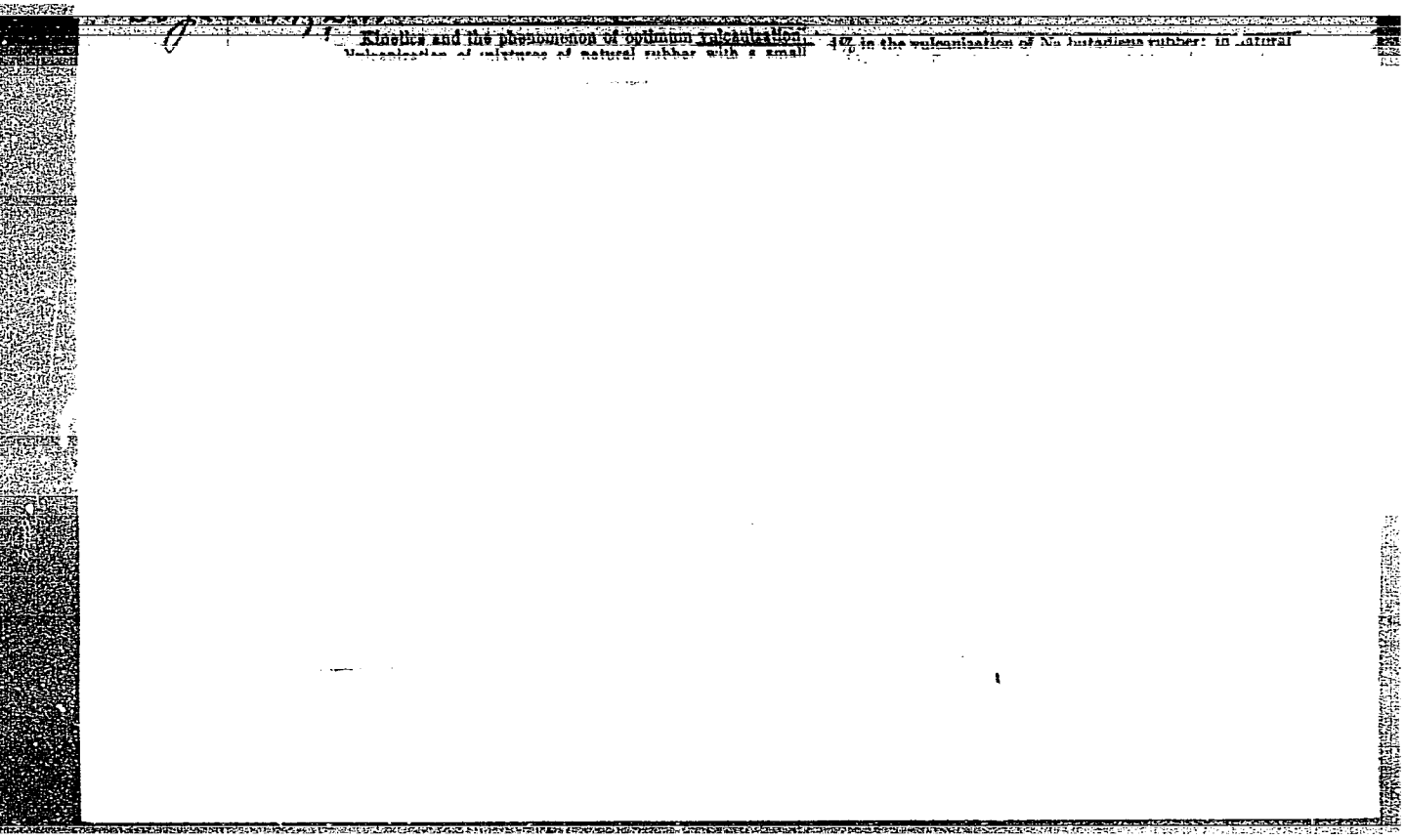
Synthetic Rubber and Allied Products

Mechanical properties of vulcanized butadiene-styrene rubber in two-dimensional deformation. G. M. BARTENEV, B. A. DOGADKIN, and N. M. NOVIKOVA (J. Tech. Phys., U.S.S.R., 1948, 18, 1282-9; Sci. Abs., 1949, 52A, 344).—It is shown that in the 2-dimensional tensile stress case the higher theory of elasticity finds a wider scope of application than in the case of linear tension; this is due to "mechanical vulcanisation" reducing the plasticity of the material. On stressing, a disruption of the local secondary bonds takes place, leading to irreversibility of contraction. The best opportunity of applying higher elasticity methods to 2-dimensional tension arises for rubbers containing 1.5% sulphur or less. 352MDD21.063424

1949



Structural changes in rubbers brought about by molecular oxygen. B. Dogadkin (Lomonossov Inst. Fine Chem. Technol., Moscow). *Rubber Chem. and Technol.* 21, 48-59(1948).—See *C.A.* 41, 3651h. C. C. Davis



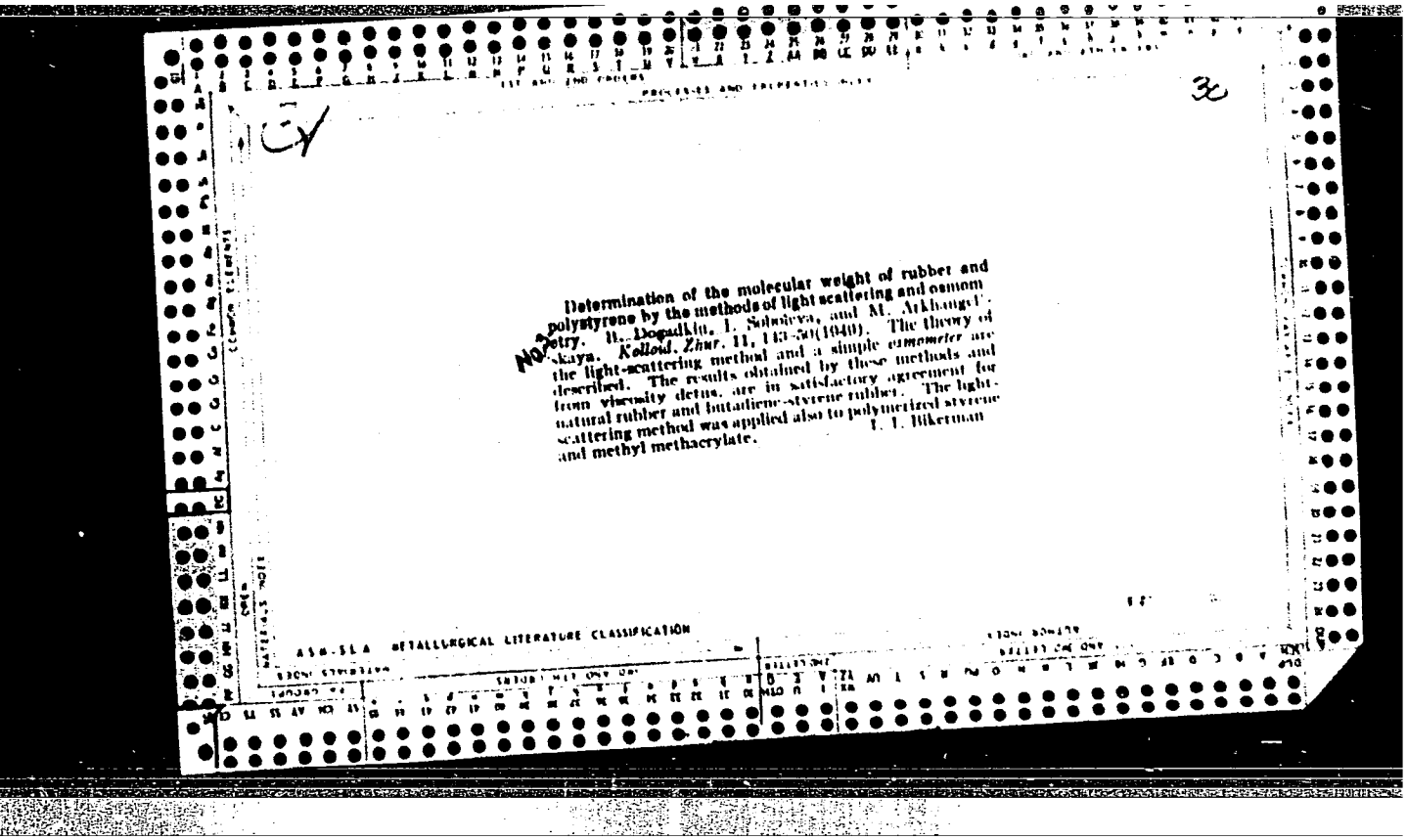
Comparative determination of molecular weight of rubber by the method of light scattering and osmometry. [illegible] Dorofkin, I. G. Soboleva, and M. Arkhangel'skaya (Lomonosov Inst. Fine Chem. Technol., Moscow). *Issledovaniye v Oblasti Vysokomolekul. Soedinenii. Doklady 6-oi Konf. Vysokomolekul. Soedinenivam. Akad. Nauk S.S.S.R.* 1949, 253–62; cf. *C.A.* 43, 7742b.—Natural rubber in a soln. of mixed toluene and EtOH gave an av. mol. wt. of 200,000–300,000 by the method of light scattering of the soln.; in toluene, the av. mol. wt. by osmometry was 200,000–240,000. The osmometer consists of a glass cell, closed by a membrane, and is provided with a graduated capillary and a Hg-sealed opening. G. M. Kosolapoff

Degtyarev, B. A.

Kinetics of highly elastic deformation B. A. Degtyarev, M. [illegible] and M. M. [illegible]

[illegible] the relaxation time with excess value of stress [illegible] derived in the form [illegible] connection with the expression [illegible] it gives the [illegible] rubberlike substances. [illegible] formation and deformation [illegible] and synthetic [illegible] above equation. Energy of activation U of the elementary transformation that composes the relaxation phenomenon is [illegible] kcal/mole; the vol. of the kinetic element of relaxation at 22° and 100% elongation is [illegible] cu. A.

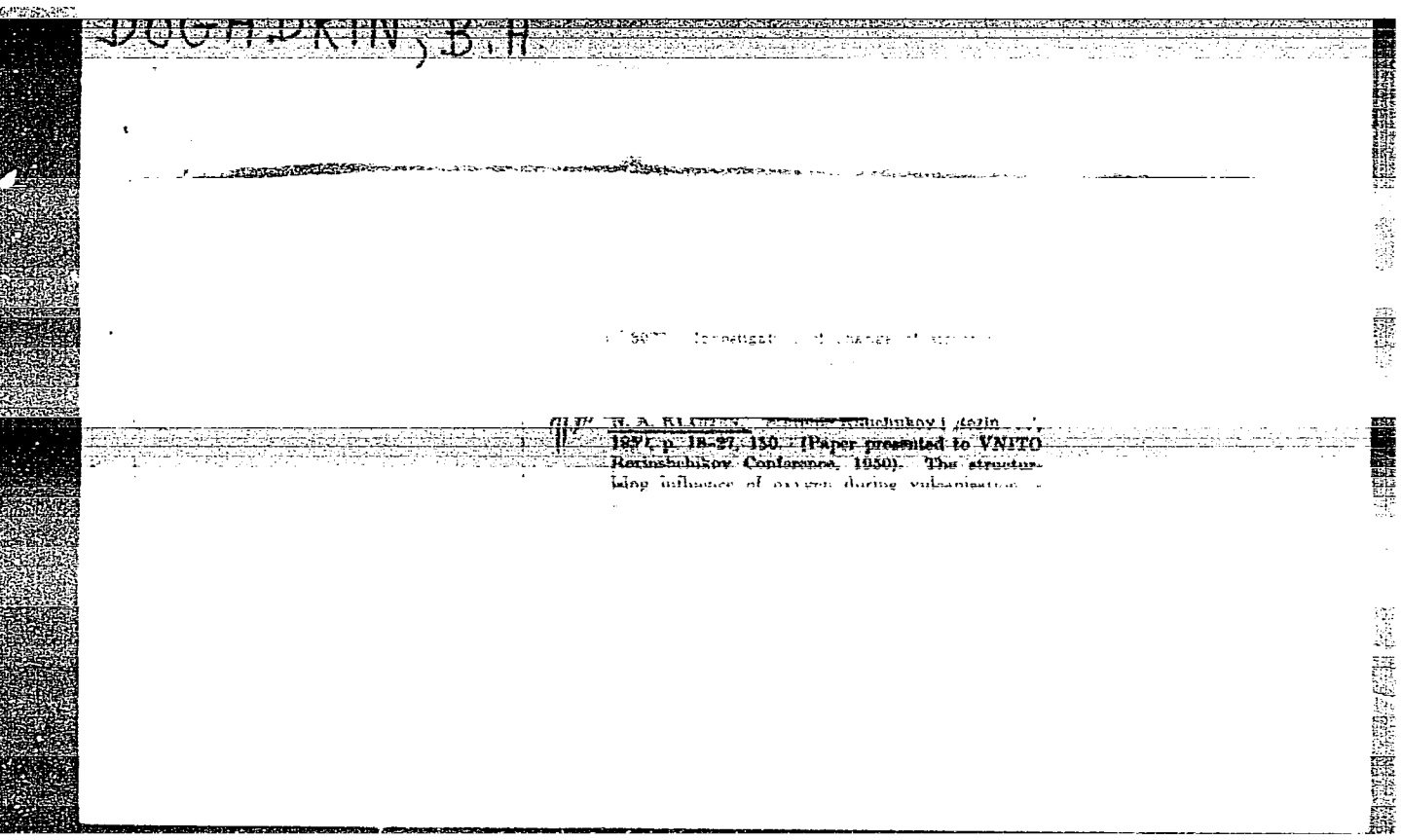
[illegible] M. Kravchenko



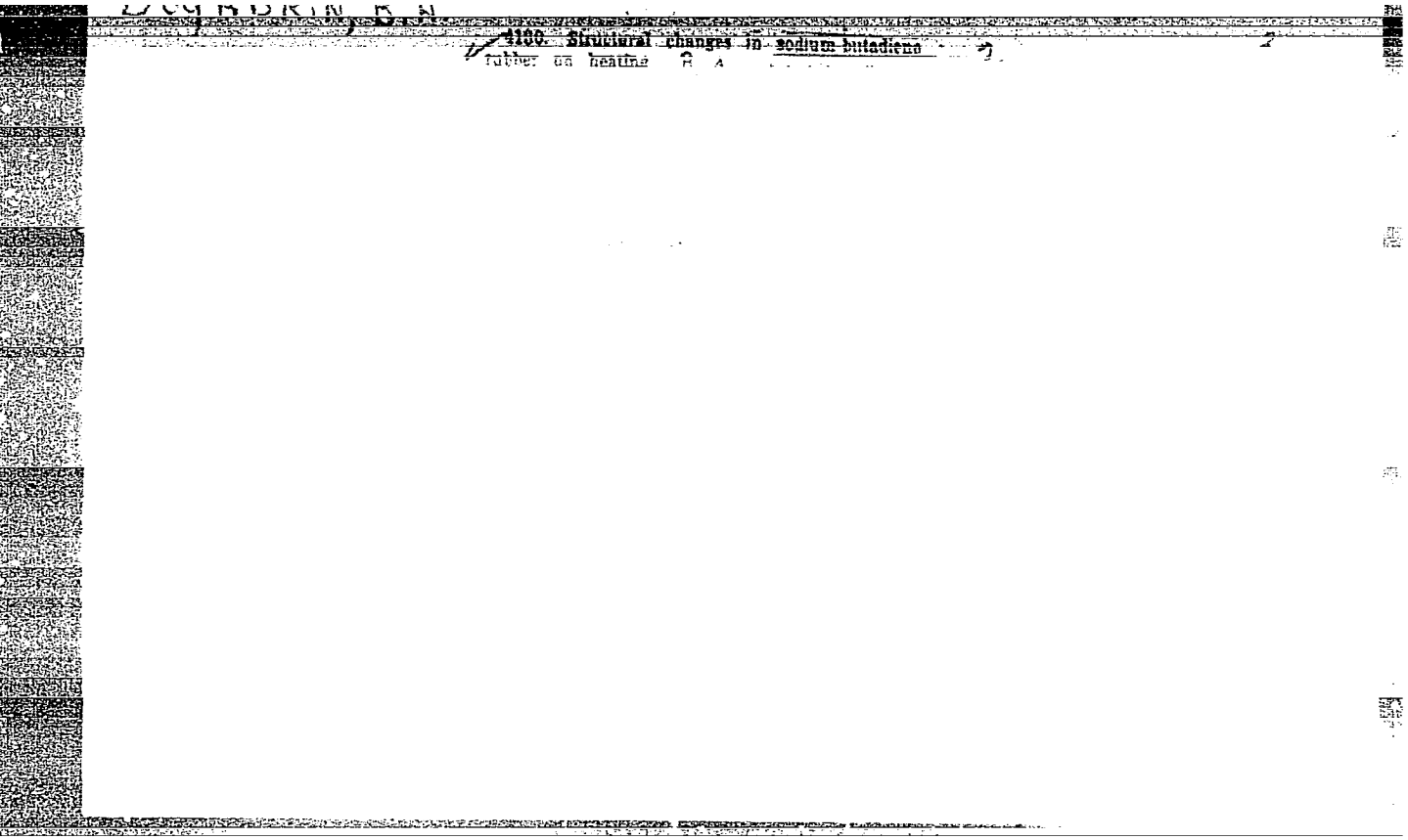
Determination of the molecular weight of rubber and polystyrene by the methods of light scattering and osmom etry. II. Dogadkin, I. Solov'eva, and M. Arkhangel'skaya. *Kolloid. Zhur.* 11, 143-50(1949). The theory of the light-scattering method and a simple *osmometer* are described. The results obtained by these methods and from viscosity detns. are in satisfactory agreement for natural rubber and butadiene-styrene rubber. The light-scattering method was applied also to polymerized styrene and methyl methacrylate.
I. I. Likerman

C.A

The importance of intermolecular forces in the mechanism of high-elastic deformation. I. Molecular mechanism and an equation for the kinetics of high-elastic deformation. B. A. Dogadkin, O. M. Bartenev, and M. M. Reznikovskii. Kolloid. Zhur. 11, 314-21(1949).—Relaxation in a deformed high-elastic material consists of 2 processes: The 1st involves reorientation of small structure elements, has periods of relaxation (τ) much shorter than a sec., and is characterized by modulus of elasticity E_0, whereas the 2nd exists only in rubberlike materials, involves reorientation of mol. chains, has large τ which varies with stress σ, and is characterized by modulus E_1. Hence, Maxwell's equation is changed to $(d\sigma_1/dt) = (E_0 - E)(d\epsilon/dt) - (\sigma_1/\tau)$ if t is time, ϵ is deformation, and σ_1 stress remaining after the completion of the 1st process. For τ, the equation $\ln \tau = \ln \tau_0 + (U/kT) - [V\sigma_1^2/2kT(E_0 - E)]$ is derived; U is energy of activation of the 2nd process and V is the vol. of "kinetic unit of relaxation." A film of smoked sheet prepd. by evapn. of a soln. in benzene was extended 100%, and $d\sigma_1/dt$ was detd. at various t and const. ϵ. The τ calcd. from these expts. was a linear function of σ_1^2, as required by theory, at 22°, 40°, and 60°. I. J. Hoffman



1897, p. 18-27, 150. [Paper presented to VNITO Reinshchikov Conference, 1950). The structu-
ring influence of [illegible] during vulcanizat[illegible]

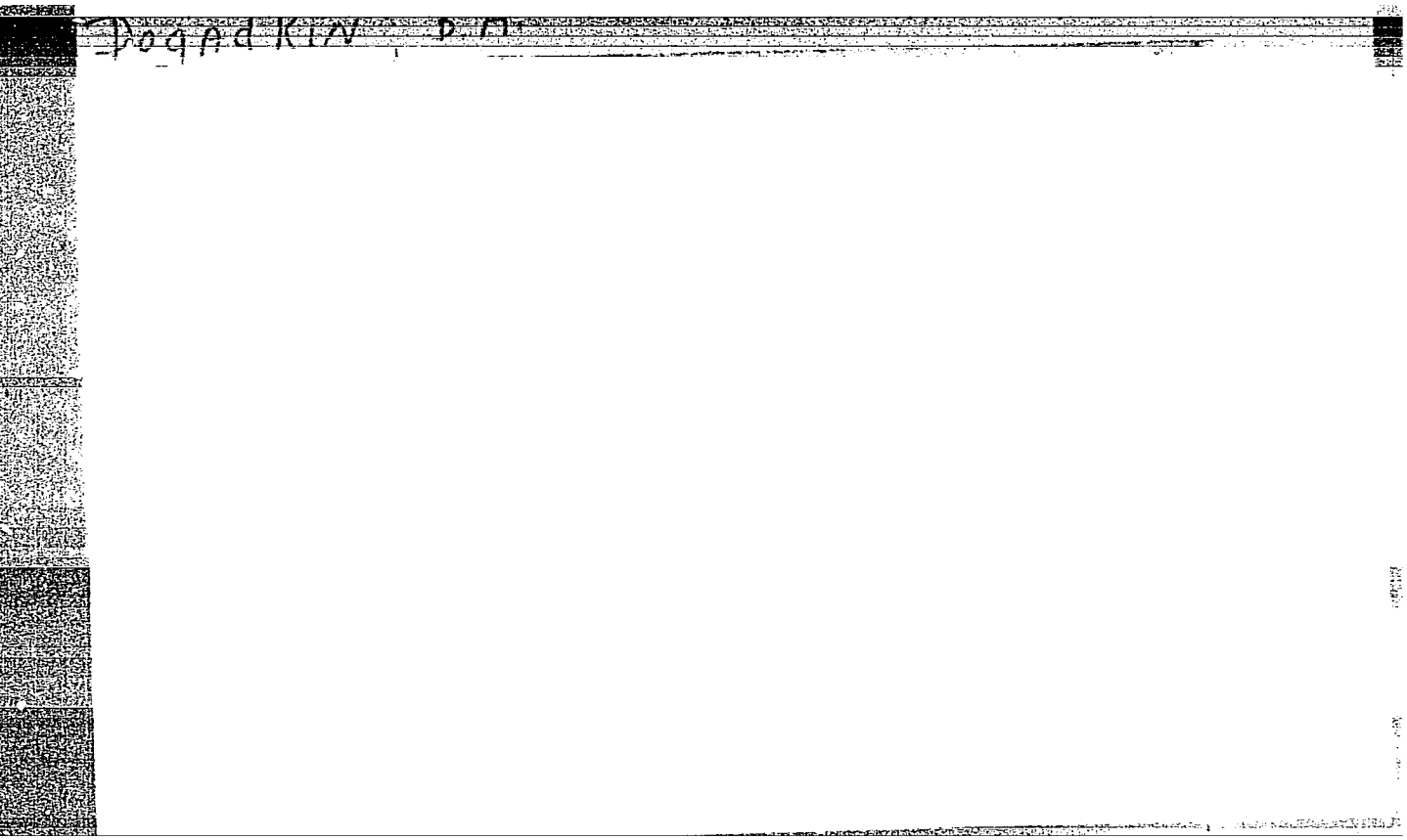


Vogel'kin, V.N.

4267. Interaction of methyl iodide with vulcanizates of natural and sodium butadiene [illegible]

degree of swelling of the [illegible]

[illegible] apart from the monosulphide bridges with radicals of allyl type, other forms of intermolecular chemical links. There are 13 references. 4526



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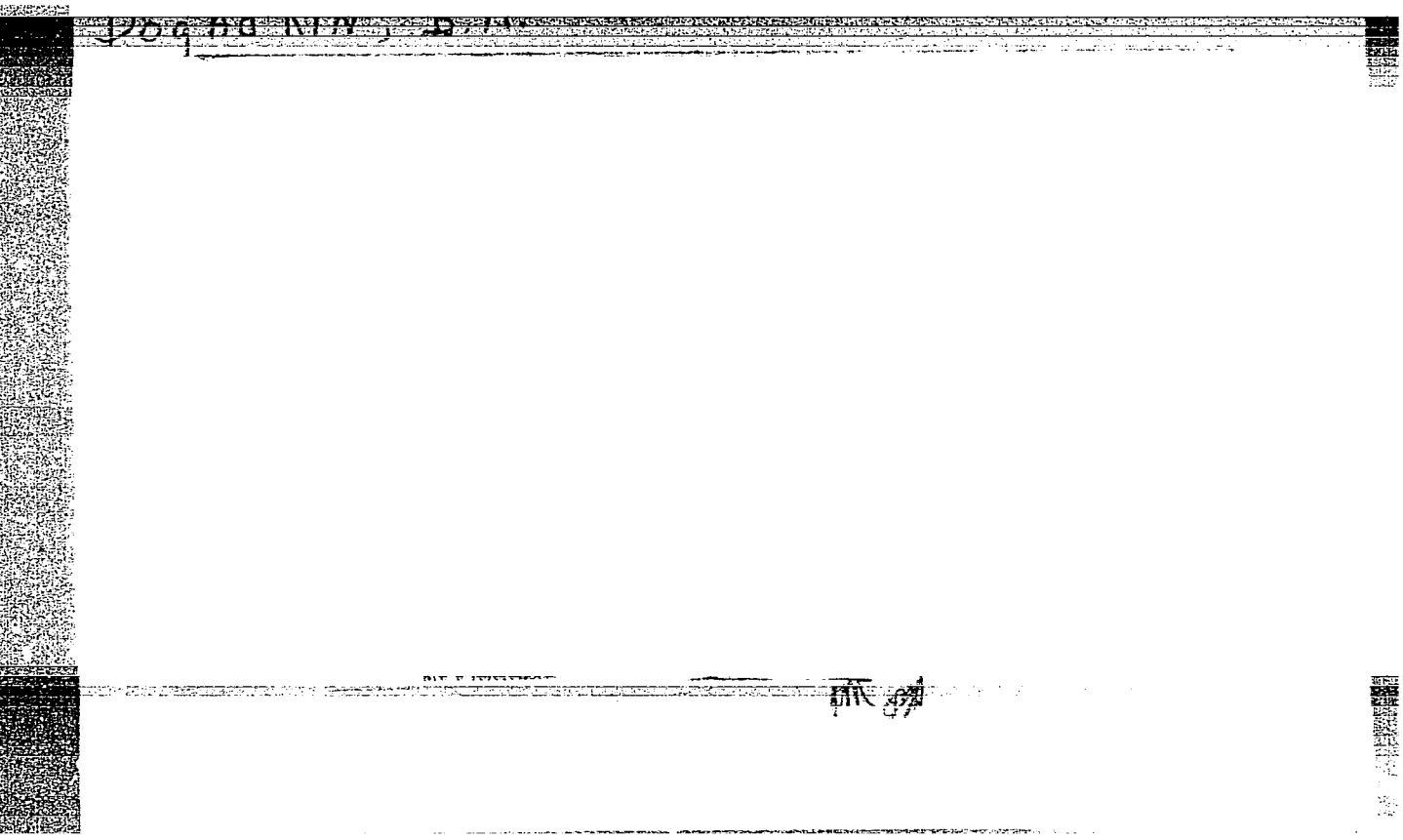

DOGADKIN B.A.

3108. Issledovaniya po Fizike i Khimii Kauchuka i Reziny. (Investigations on the Physics and Chemistry of Unvulcanised and Vulcanised Rubber). U.S.S.R. NAUCHNO-ISSLEDOVATEL'SKI INSTITUT SHINNOI PROMYSHLENNOSTI. V. F. EVSTRATOV, and B. A. DOGADKIN, editors. Trudy Nauchno-Issledovatel'skogo Instituta Shinnoi Promyshlennosti. Moscow and Leningrad, Goskhimizdat, 1950, pp. 148. Price, 7 roubles. This volume of transactions includes: B. Gengrinovich and V. Tarasov on calorific and thermal properties of natural rubber in the orientated and non-orientated states; B. Dogadkin on kinetics and the phenomenon of optimum vulcanisation; B. Dogadkin and D. Pevzner on structural changes in sodium-butadiene rubber on heating; B. Dogadkin, B. Karmin and A. Stukalova on the interaction of methyl iodide with natural and sodium-butadiene vulcanisates; B. Lukin and V. Kamatochkin on X-ray study of the vulcanisation process; G. Betts and B. Karmin on plasticisation of butadiene-styrene rubbers; B. Dogadkin, K. Pechkovskaya and V. Kupriganova on the structure and properties of mixes of sodium-butadiene rubber with 'Ukhtinskaya' channel black; B. Dogadkin, K. Pechkovskaya, S. Simanovskaya and V. Kupriyanova on structure and properties of mixes of sodium-butadiene rubber with furnace and

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M. A. 10 OCT 2 copies

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V. F. Evstratov ...

lamp blacks; B. Dogadkin, K. Pechkovskaya, S. Punko and S. Simanovskaya on electron-microscopic study of sodium-butadiene and smoked sheet mixps with channel black; and B. Reznik on microdetermination of sulphur in vulcanizates by fusion with metallic potassium. 013

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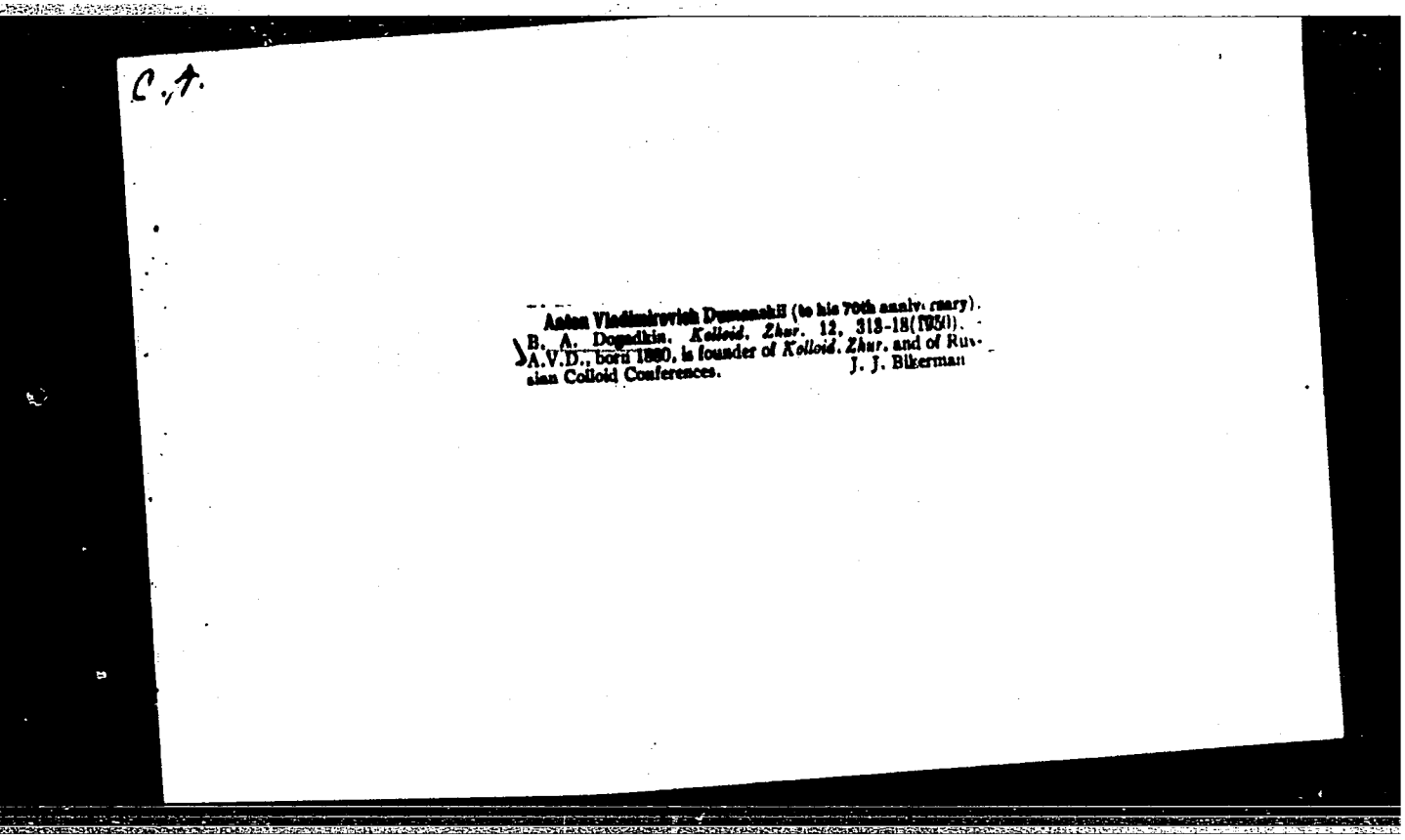
The importance of intermolecular forces in the mechanism of high-elastic deformation. II. Relaxation properties of natural rubber and its bromination products. B. A. Dogadkin and M. M. Reznikovskii (Inst. Fine Chem. Technol., Moscow). *Kolloid. Zhur.* 12, 102–11 (1950); cf. *C.A.* 44, 907c.—Brominated smoked sheet (I) differs from smoked sheet (II) only by its higher concn. of polar groups; thus, comparison of I and II should show the importance of intermol. forces. I was prepd. from II and Br in the presence of I in CCl_4 at 0°; its Br content was 83% of the theory, and its mol. wt. (from light scattering) was 400,000, in comparison with 213,000 of the starting II. I showed no crystal pattern, even after 300% extension. When the samples were deformed and the deformation was kept const., the stress σ decreased according to $-(d\sigma/dt) = (\sigma - \sigma_0)/\tau$ and $\log \tau = \log \tau_0 - \beta \cdot (\sigma - \sigma_0)^2$. The equil. stress σ_0 was detd. by keeping the deformed sample at 70° for about 40 min. and cooling it to the temp. of the expt. The σ_0 of II was zero, and of I, e.g., 50 kg. wt./sq. cm. The const. τ_0 was independent of deformation (extension), but decreased when the temp. was raised, for II it was, e.g., 80 hrs. and 30 min. at 5° and 80°, resp., and for I it was, e.g., 100 and 20 min. at 22° and 80°, resp. The const. β (cm.^{4}/kg. wt.^{2}) decreased when extension increased; it was, e.g., 0.118 and 0.010 at 62% and 407% extension, resp., at 22.5°; and 0.119 at 102% extension and 80° for II, and 0.001 and 0.000013 at 50°, and 300% extension, resp., at 22°, and 0.052 at 102% extension and 80° for I. From τ_0, the energy of activation was calcd.; it was 16,000 ± 1000 cal. for the kinetic unit of relaxation U in II, and 5000–6000 cal. for I. The bonds in I are those between Br atoms. The decrease of U (which is proportional to β) on extension shows that orientation of mol. chains, produced by extension, increases the no. of bonds between chains. I. J. R.

CA

The importance of intermolecular forces in the mechanism of high-elastic deformation. III. Effect of swelling on mechanical properties of vulcanized rubber. B. A. Dogadkin and V. E. Gul (Inst. Fine Chem. Technol., Moscow). *Kolloid. Zhur.* 12, 184-93(1950); cf. *C.A.* 44, 6183c. Benzene-N mixts., whose compns. could be varied at will (app. described), circulated through a wide glass tube in which a sample of rubber was suspended on a spring balance, and another sample (a ring) was placed over 2 hooks, one fixed, the other attached to a loaded trolley moving along a rail. When the wt. increased (= degree of swelling, x %) of the first sample became const., the tube was tilted, and the load extended the 2nd sample. Then the tilt, i.e. also the stress σ, was gradually reduced so as to keep the extension const. For vulcanized natural (I) and chloroprene rubber (II), the decrease of σ in time was similar at all x values and did not conform to Flory's theory (*C.A.* 38, 2915[9]). The mol. wt. of segments, calcd. from this theory, increased with x. In agreement with the theory of Dogadkin, *et al.*, the relaxation time τ was a linear function of $(\sigma - \sigma_0)^{1/2}$; σ_0 is the equil. stress. The limit of τ at $\sigma - \sigma_0 = 0$ is τ_0. When x of I increased, τ_0 decreased (e.g., from 350 sec. at $x = 0$ to 80 sec. at $x = 20\%$) because the no. of possible configurations of the chains increases with x. Between, e.g., $x = 20\%$ and 30%, τ_0 increased (e.g. to 330 sec.); it decreased again on further increase of x. These 2 stages are due (1) to straightening of the chains and (2) rupture of links between chains. Similar τ_0-x curves were observed for I swollen in $CHCl_3$; the difference between max. and min. τ_0 and x corresponding to min. τ_0 were greater, the lower the temp. (15-30°). The τ_0-x curve for II swollen in benzene for 1 min., and that for II in $CHCl_3$ regularly decreased from 1100 sec. at $x = 0$ to 100 sec. at $x = 110\%$. I swollen in $CHCl_3$ was extended by 150% 80 times per min., and the no. n of cycles before rupture detd. Log n was 4.5 at $x = 0$, 3.7 at $x = 20\%$, and 6.5 at 110% at 24°; i.e., also showed a min. The relative deformation of I in $CHCl_3$ increased with x. At a given strain, the stress and the total elongation at rupture of I and II in benzene were smaller the greater x.

J. J. Bikerman



C.A.

Anton Vladimirovich Dumanskiĭ (to his 70th anniversary).
B. A. Dogadkin. *Kolloid. Zhur.* 12, 313-18(1950).
A.V.D., born 1880, is founder of *Kolloid. Zhur.* and of Russian Colloid Conferences. J. J. Bikerman

DOGADKIN, B. A.

USSR/Engineering - Testing, Equipment Dec 50

"Device for Studying the Mechanical Properties of High-Elastic Materials," B. A. Dogadkin, V. Ye. Gul', Moscow Inst Fine Chem Tech

"Zavod Lab" No 12, pp 1517-1519

Device permits various studies of rubber such as: plotting load-deformation diagrams, observation of changes in length under const load and after its removal, observation of stress relaxation at const deformation, detn of fatigue limit and others. Tests may be in vacuum or in some medium

182T67

USSR/Engineering - Testing, Equipment (Contd) Dec 50

with simultaneous irradiation of specimens with light of given wave length. Illustrations and description of tester.

182T67

DOGADKIN, B.

Reznikovskii, M., Tarasova, Z. & Dogadkin, B. - "Solubility of oxygen in some organic liquids." (p. 63)

SO: Journal of General Chemistry, (Zhurnal Obshchei Khimii), 1950, Vol. 20, No. 1

CA

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Rubber vulcanization. VI. Change in two-dimensional extension modulus during vulcanization of natural and butadiene-styrene rubbers. B. A. Dogadkin, G. Bartenev, and N. Novikova (Lomonosov Inst. Fine Chem. Technol., Moscow). *Rubber Chem. & Technol.* 23, 553-62(1950). See *C.A.* 43, 8192g. **VII. Influence of organic accelerators on the kinetics of vulcanization and the properties of natural-rubber vulcanizates.** B. A. Dogadkin, B. Karmin, A. Dobromyslova, and L. Sapozhkova (Lomonosov Inst. Fine Chem. Technol., Moscow). *Ibid.* 563-75.—See *C.A.* 43, 8193a.

C. C. Davis

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Change in the relaxation properties of vulcanized rubber on swelling. B. A. Dogadkin and V. R. Gul (Moskov Inst. Tonkol Khim. Tekhnol. im. M. V. Lomonosova). *Doklady Akad. Nauk S.S.S.R.* 70, 1017–19(1950). Curves of stress relaxation with time of vulcanized natural rubber at different degrees r of swelling in $CHCl_3$ show an initial relatively rapid decrease, followed by a relatively slower rate; at equal times, the stress σ is the lower, the higher r. The exptl. curves deviate from the relation of Flory and Rehner (C.A. 38, 2019) $\sigma = (\sigma RT/M_c)(r^{1/3})[\alpha-(1/\alpha^2)]$ between σ, r, the deformation α, and the equil. mol. wt. M_c of the chain fragment comprised between 2 points of the space net. The calcd. M_c, plotted against r (up to 34°C.), shows an initial increase, with a tendency to level off to a const. value; this indicates a rupture of intermol. interaction under the action of the solvent. Relaxation times τ, calcd. from the exptl. data for vulcanized natural rubber in CCl_4 by the relation: $\tau = \tau_0 \exp[(U_0 - (1/2)E_1\sigma_1^2]/kT]$, where $\sigma_1^2 = \sigma - \sigma_\infty$ = nonequil. part of the stress (σ_∞ = stress at equil.), E = modulus of elasticity, and $E_1 = E_0$ (initial) $- E_\infty$ (equil.), U_0 = activation energy, referred to the kinetic relaxation element U, show, at 24°, an initial fall with increasing swelling up to $Q = 0.20$ moles C_6H_6 per 100 g. mixt., followed by a rise with Q, increasing to 0.30, and again a decrease with further increasing Q. A similar curve is obtained on swelling in $CHCl_3$. This behavior is indicative of a nonhomogeneity of the structure of vulcanized rubber. At higher temp. (30.5°) the curve is relatively smoother, and the min. of r is shifted to lower Q. In contrast to natural rubber, vulcanized polychloroprene in $CHCl_3$ shows a uniform decrease of r with increasing Q. The fatigue resistance of natural rubber in $CHCl_3$, expressed by the log of the no. of cycles withstood before rupture, shows an initial decrease with increasing Q, with a min. at about $Q = 0.13$, followed by a rise with further increasing Q. The range of decreasing fatigue resistance coincides with the range of increasing r in the same solvent. N. Thon

Destructive solution of vulcanized synthetic rubbers. B. A. Dogadkin and Z. Tarasova (M. V. Lomonosov Inst. Fine Chem. Technol., Moscow). *Doklady Akad. Nauk S.S.S.R.* 73, 701-4(1950).—The rate of soln. in xylene at 110°, in O, under a pressure of 760 mm. Hg. increases in the order: Butyl (I) < Na-butadiene polymer (II) < butadiene-styrene copolymer (III) < polychloroprene (IV) < natural rubber (V). This order corresponds to the concns. of double bonds in the main chains of the polymers, with the added slowing-down effect of electrophilic groups in the mols.; it is owing to this latter effect that IV dissolves more slowly than V. Double bonds in the side chains have no effect on the rate of soln., rather, interaction between O and side-chain vinyl groups leads to structure formation, i.e., the reverse of destructive dissoln. On the basis of expts. with butadiene rubbers differing in the proportion of double bonds (in the main chain) of the 1-4 type (50, 54, and 43%, relative to natural rubber taken as 100%), the rate of destructive soln. increases linearly with that proportion. The straight line does not pass through the origin; this indicates that double bonds of the 1-2 type are involved in the reverse process of structure formation. At const. O pressure, the rate of soln. V is given by the difference of the rates of the 2 opposing processes: $V = k_1c - k_2(1 - c) = -k_2 + (k_1 + k_2)c$, where c is the concn. of double bonds of the 1-4 type, $1 - c$ that of 1-2 type. For vulcanizates contg. tetramethylthiuram disulfide as accelerator, under 760 mm. Hg of O, at 120°, and provided the surface area of the vulcanizate remains const., V (in g./sq. cm./min.) $= -4 \times 10^{-6} + 1.2 \times 10^{-7} c$, where c is expressed in % of the total double bonds of the polymer. This relation makes it possible to det. c from the observed V. In terms of the surface area S and the O concn., the rate of soln. is $k[O_2]S$; the soly. of O in xylene in the temp. range 23-100° is given by $160.5 + 0.395\,t$. With this expression for $[O_2]$, the activation energies of soln., from the linear plots of log k against $1/T$, are detd. as II 31.3 (100-132°), III 27.2, and V 19 kcal./mole (87-107°). The high activation energies of II and of III when compared with V are due to vinyl-group side chains. The destructively dissolved vulcanizate II forms a yellowish opalescent soln., from which MeOH ppts. about 70% of the substance; the ppt., dried *in vacuo* at 20°, is sol. in all the usual rubber solvents. Chem. analysis shows carboxyl-O 5.4 mg./g., ether-O 12 mg./g., peroxide-O 1.2%, total O ~ 4%. By cryoscopy in C_6H_6 the particle wt. is 3900-2400, and increases with decrease in concn. The sp. viscosity $\eta = 24.0\,v$, where v = sp. vol. of the vulcanizate and c its concn. in g./l. The numerical value of the coeff. gives for the axes ratio of the ellipsoid, 15, compared with 65 for crude Na-butadiene elastomer. The fact that this coeff. is about 10 times greater than the coeff. of the Einstein equation indicates that, as a result of swelling, the effective vol. of the particles of the destructively dissolved vulcanizate is about 10 times greater than in the solid state.

N. Thon

184T21

USSR/Chemistry - Elastomers Jan/Feb 51

"Relaxation Processes in the Deformation of Pure Rubbers and the Effect of the Degree of Vulcanization," B. A. Dogadkin, M. M. Reznikovskiy, Sci Res Inst of Rubber Ind

"Kolloid Zhur" Vol XIII, No 1, pp 11-19

Applies previously proposed eq of kinetics of highly elastic deformation to 3-dimensional polymers in study of process of relaxation of tension with different initial elongations and process of deformation of const-rate elongation for pure rubbers at temps 20-70° C. Finds relaxation

LC

184T21

USSR/Chemistry - Elastomers (Contd) Jan/Feb 51

properties of soft pure natural and synthetic rubbers essentially unchanged by vulcanization. Proposes constancy exists up to point where nodes of spacial lattice are so far apart as not to influence interaction or thermal motion of chain sections in between.

LC

184T21

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Effect of temperature and rate of stretching on the strength of vulcanizates. B. A. Dogadkin and D. M. Sandomirskii (Inst. Fine Chem. Technol., Moscow). *Kolloid. Zhur.*, 13, 267-72(1951); cf. *C.A.* 45, 4084i.—Rings of vulcanized rubbers A (rubber 100, S 2, ZnO 5, tetramethylthiuram disulfide 0.5) and B (rubber 100, ZnO 5, tetramethylthiuram disulfide 3) were broken by tension. The stress at rupture Π (referred to the actual cross-section) was σe^{α}; v is the rate of extension, and σ and α are consts. Π increases with v because, at higher v, deorientation of the cryst. fraction (present in the unstressed rubber) has less time to occur. As this deorientation is more rapid at higher temps., *T*, Π decreases when *T* increases. Between 10 and 80°, $\Pi = \Pi_0 e^{-UT}$; the const. *U* was, for A and B, resp., 3900 and 3800 cal./mole at v = 1.2 mm./min., 4900 and 4900 at v = 10.9, 4200 and 4800 at 100 mm./min., and 4200 and 4200 at 1000 mm./min. *U* is calcd. to be 4300 for butadiene-styrene rubber at v = 100, 6700 for Na-butadiene rubber at v = 800, 1800 for natural rubber at v = 800, 7200 for Butyl rubber at v = 500, 13,000 for chloroprene rubber at v = 10, and 7100 for oxidized Na-butadiene rubber at v = 1. At 100° and above, Π of A and B was independent of v as long as v was <100 and decreased but little on raising the temp. The total elongation of A decreased when *T* increased and v decreased, showing that no plastic flow was taking place.

J. J. Bikerman

DOGADKIN, B. A.

Nov/Dec 51

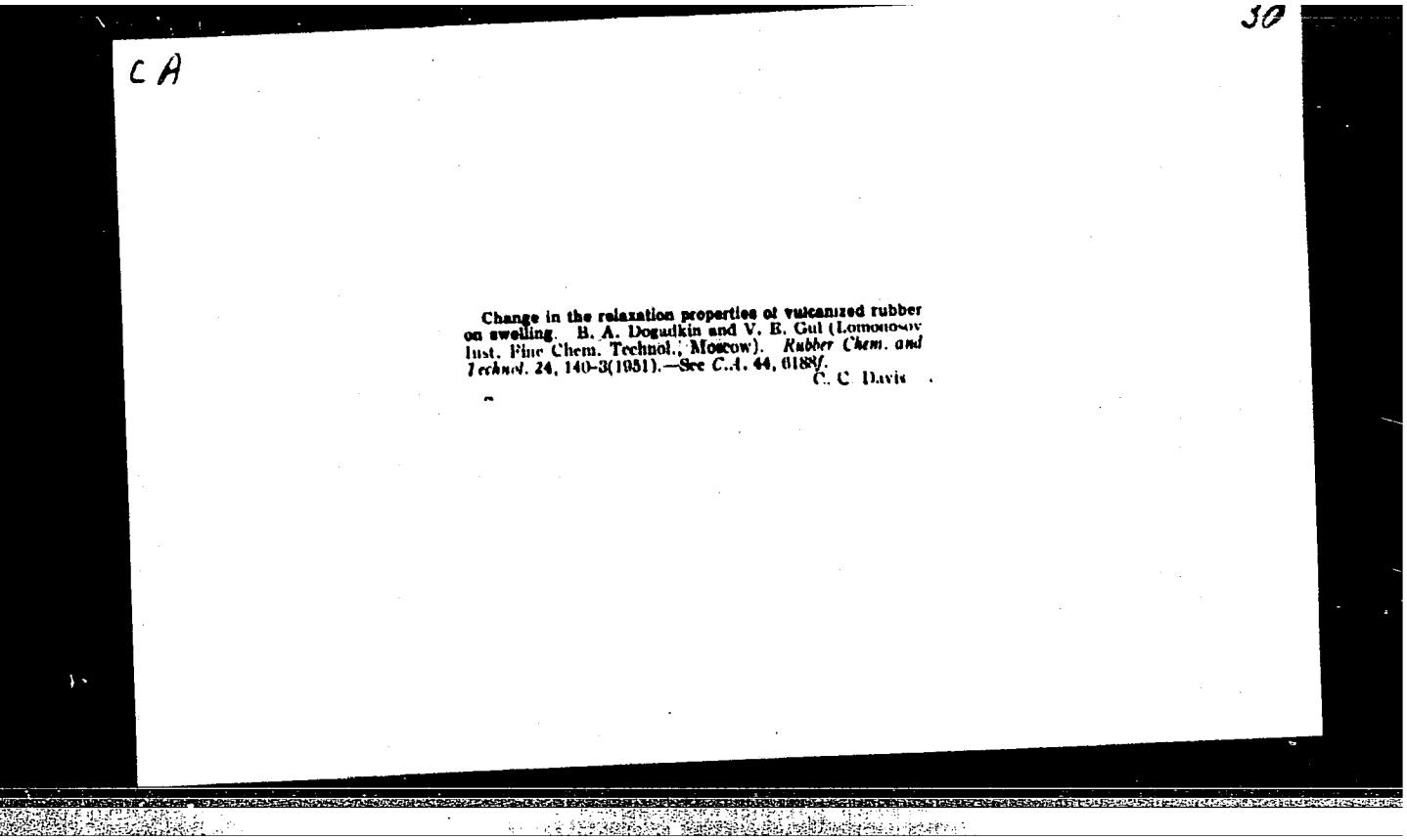
USSR/Chemistry - Rubber
Elastomers

"Investigation of the Role of Intermolecular Forces in the Mechanism of Highly Elastic Deformation. V. Effect of Intermolecular Interaction on the Strength of High Polymers with Well-Expressed Spatial Structure," V. Ye. Gul', N. Ya. Sidneva, B. A. Dogadkin, Chair of Rubber Phys and Chem, Moscow Inst Fine Chem Technol imeni M. V. Lomonosov

"Kolloid Zhur" Vol XIII, No 6, pp 422-431

Investigated mech characteristics of vulcanizates of SKN-18, SKN-26, SKN-40 rubbers with spatial structure developed to identical deg but different nitrile-group concn in chain mols. Within exptl limits presence of O2 did not affect mech characteristics, but strength characteristics increased with increased concn of nitrile-group, i.e., with higher intensity of intermol interaction. Proposes model for describing resistance characteristics of rubber-type high polymers and eq relating resistance to temp and rate of deformation.

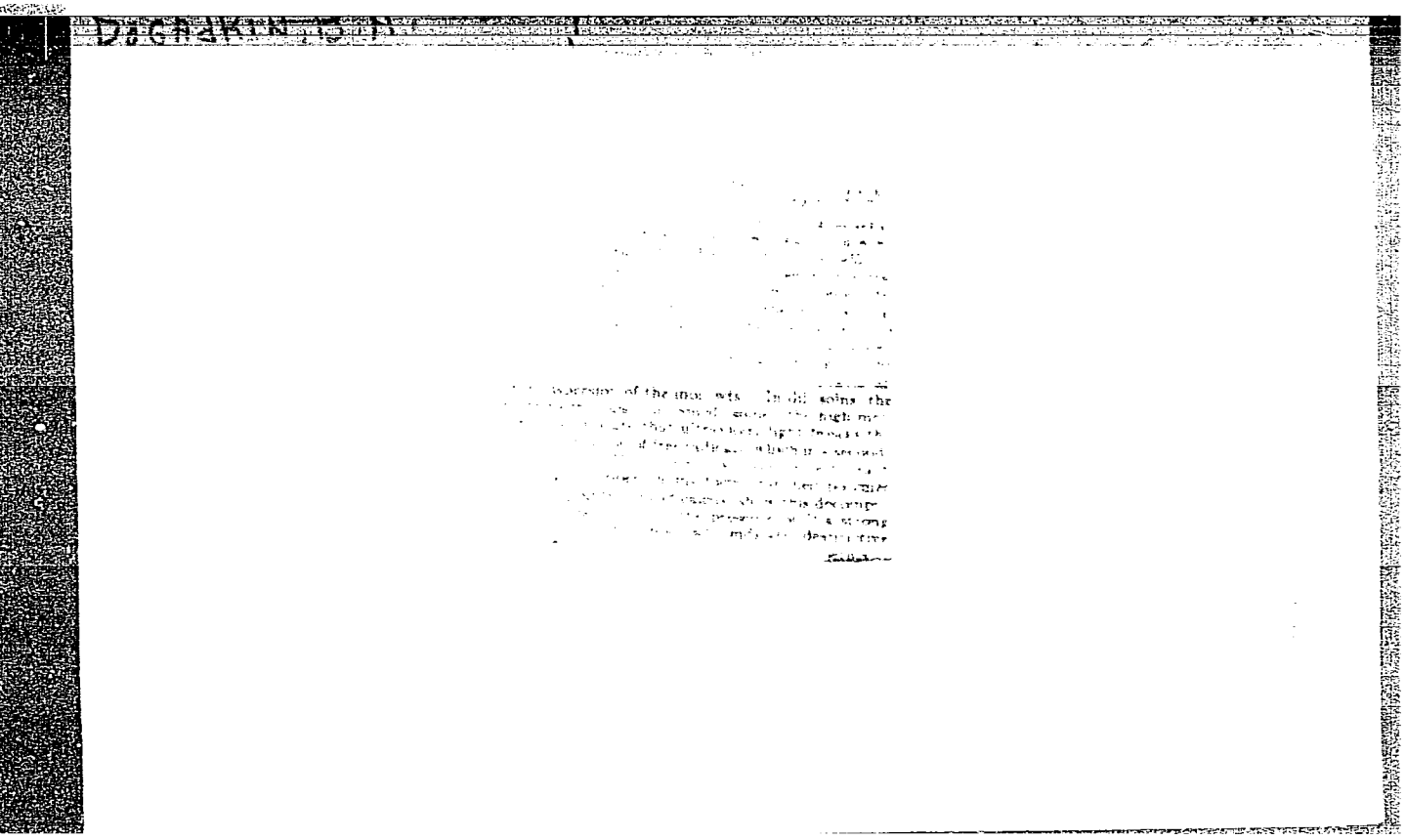
198T8



30

CA

Change in the relaxation properties of vulcanized rubber on swelling. B. A. Dogadkin and V. E. Gul (Lomonosov Inst. Fine Chem. Technol., Moscow). *Rubber Chem. and Technol.* 24, 140-3(1951).—See *C.A.* 44, 6188*f*.
C. C. Davis



USSR/Chemistry - Elastomers May/Jun 52

"Investigations of Rubber Vulcanization. X. Vulcanization of Natural Rubber With a Sulfur Dioxide-Hydrogen Sulfide Mixture," B. Dogadkin, F. Kheyfets, Sci Res Inst of the Tire Ind

"Kolloid Zhur" Vol XIV, No 3, pp 157-163

The dynamics of the change of rubber during vulcanization by the above method, without use of the customary sulfur vulcanizer are described by a monotonic curve with no optimum vulcanization point. After repeated vulcanization cycles, a content of

217T13

S higher than 3% reduces the tensile strength. Changes of stability of the vulcanized rubber as a function of the sulfur content are considered from the stand point of the effect of the thickness of the network of the vulcanized rubber on orientation processes during deformation.

217T13

DOGADKIN, B.

DOGADKIN, B.

USSR/Chemistry, Colloid,Rubber, Carbon Black Jul/Aug 52

"Structure and Properties of Rubber Compositions Containing Fillers. IX. Modifications of Carbon Black Structures as a Result of Multiple Deformations," K. Pechkovskaya, Ts. Mil'man, B. Dogadkin, Sci Res Inst of the Tire Ind

"Kolloid Zhur" Vol XIV, No 4, pp 250-259

PA225T12

1. DOGADKIN, B.; PECHKOVSKAYA, K. K.; MIL'MAN, TS.

2. USSR (600)

4. Rubber

7. Structure and properties of filled rubber mixtures. Part 10. Influence of temperature on change in the structure of carbon black. Koll. zhur. 14, No. 5, 1952.

9. Monthly List of Russian Accessions, Library of Congress, January 1953. Unclassified.

3959 **Investigations in the field of rubber vulcanisation. XI. Effect of degree of vulcanisation on the internal friction of uncompounded butadiene-styrene vulcanisates.** M. M. Reznikovskii, V. S. [illegible] I. S. [illegible] (J. [illegible] Chem. [illegible] 1954, 27, [illegible] 11 [illegible]) [illegible] work [illegible] study [illegible] [illegible] the spatial [illegible] structure [illegible] [illegible] which [illegible] [illegible] reversible [illegible] [illegible] vulcanisates were [illegible] with [illegible] different [illegible] [illegible] about [illegible] 30%, the total and free sulphur were determined analytically. Measurements of internal friction were made by means of tests on a Bidermann pendulum, the Schob apparatus, and a K[illegible] vibrator. Reasons are given for considering that the Bidermann apparatus gives the most reliable results, and this apparatus is illustrated. The theory of the measurements is discussed in detail. A float dynamometer is also illustrated, for measuring the equilibrium stress in the test specimen. In conclusion, it is stated that internal friction and the related relaxation properties do not depend on the percentage of combined sulphur up to [illegible]%; further increase causes a sharp increase. It is also shown that, up to 5%, the nature of the stress in the rubber is predominantly entropic, while further increase causes an increase in the energy component of the stress. The values of the molecular weights of a chain segment between cross links were calculated from these results, and shown to have a critical value of about 7,000 for this polymer; further tightening of the network causes the sharp increase in the internal friction and the energy component of the stress. The hypothesis is advanced that this critical value can be regarded as a criterion of the flexibility of the molecular chains of the polymer. 25^D9 M[illegible]6729.

Jones

2

DOGADKIN, B.

Card 1 Of 2

USSR/Chemistry - Rubber, Synthetic Jun 52

"Structural Changes in Rubber Caused by the Action of Molecular Oxygen. V. Destructive Solution of Vulcanized Synthetic Rubber," Z. Tarasova, B. Dogadkin

"Zhur Obshch Khim" Vol XXII, No 6, pp 935-945

Vulcanized synthetic rubbers, when heated in hydrocarbon media contg mol oxygen, completely go into soln. The kinetics of destructive soln of vulcanized synthetic rubbers conforms to the same laws as that of natural rubber. The rate of destructive soln depends on the mol structure of the rubber. In ascending order, the rate of destructive soln is:

218T16

USSR/Chemistry - Rubber, Synthetic (Contd 1) Jun 52

butyl rubber ← sodium-butadiene ← butadiene-styrene ← chloroprene ← natural rubber. The apparent energy of activation for natural rubber is 19 kcal/mol, for sodium-butadiene 31.2 kcal/mol, for butadiene-styrene 27.1 kcal/mol. The rate of destructive soln of butadiene rubber is in a linear relation to the content of structure of type 1,4 (ratio between double bonds in main and branch chains) in the rubber mol. The mech property of vulcanizates have no appreciable effect on the rate of destructive soln. The accelerators used are of great importance, and their effect corresponds to their action on the rate of oxygen addn. Water, by retarding the addn of oxygen, retards the soln of vulcanizates from natura

218T16

DOGADKIN, B.

USSR/Chemistry - Rubber, Synthetic (Contd 2) Jun 52

and sodium-butadiene rubber. The rate of destructive soln of vulcanizates in various solvents is in linear relation to the coeff of absorption of oxygen in the solvent. The viscosity of solns of destroyed vulcanized sodium-butadiene rubber is linearly dependent on the concn up to 5%. The av mol wt of particles, detd cryoscopically for sodium-butadiene vulcanizate is 2,400 to 3,600, osmotically 16,000. The axis ratio is 1:15. It is suggested that solns of destroyed vulcanizates are a special type of colloidal solns.

218T16

CA 239T22

USSR/Chemistry - Rubber Vulcanizers Accelerators Aug 52

"Thermal Decomposition of Vulcanized Structures of Deformed Vulcanizers Containing Different Accelerators," B. Dogadkin and Z. Tarasova, Sci Res Inst of Tire Production

"DAN SSSR" Vol 85, No 5. pp 1069-1072

The thermal stability of vulcanized rubber will depend on what type of bond prevails in its mol. In S-vulcanized rubber, there are four possible types of bonds, i.e., C - C, C - S - C, C - S - C, and C - S_n - C. Four types of vulcanized rubber were selected among natural and butadiene rubbers: vulcanized with

239T22

S alone, without S, with tetra-methylthiuram disulfide with S and diphenylguanidine accelerator, and with S and mercaptobenzothiazole accelerator. By measuring the strain relaxation at 70° and 100° in an inert atmosphere and using some other data (solubility in synthim, etc.), these rubbers were characterized with respect to the prevalent bonds. Submitted by Acad P. A. Rebinder 29 May 52.

239T22

DOGADKIN, B.

tion of stronger bonds increases. With active car-
bon blacks the C–O bonds are stronger than the C–
rubber bonds, with furnace black, the two types of
bond are of approximately equal strength, while with

DOGADKIN, B.A.

4873. Importance of inter-molecular forces in the mechanism of high-elastic deformation. VII Effect of the molecular interaction on fatigue strength of high polymers having a pronounced space structure. V. E. GUL', L. I. FEDYUKIN and B. A. DOGADKIN. *Kolloid. Zhur.*, 1953, 15, 11-19; *Chem. Abs.*, 1953, 47, 6155. Cf. this journal, 1952, abs. 2457. A vulcanisate of natural rubber containing 30% of carbon black was deformed 1040 times/min.; its temperature first rose rapidly, attributed to the heat of internal friction, and then slowly, due to a chemical process. In the absence of the latter, the final temperature would be T, and when the vulcanisate swells in paraffin oil, this decreases. Swelling weakens the intermolecular forces, and if these are weakened in another manner, T, is lowered likewise. Thus, vulcanisates of synthetic rubber had a higher T, the greater the percentage of CN groups. The fatigue resistance and coefficient of mechanical loss were both lowered by strong swelling, and for strong swelling (greater than 15%), the tension strength decreases. 63401

Rubber Abs. V-31 No. 1953 Vulcanized Natural Rubber

Chem 3

AF - 64

DOGADKIN, B.A.; LUKOMSKAYA, A.I.

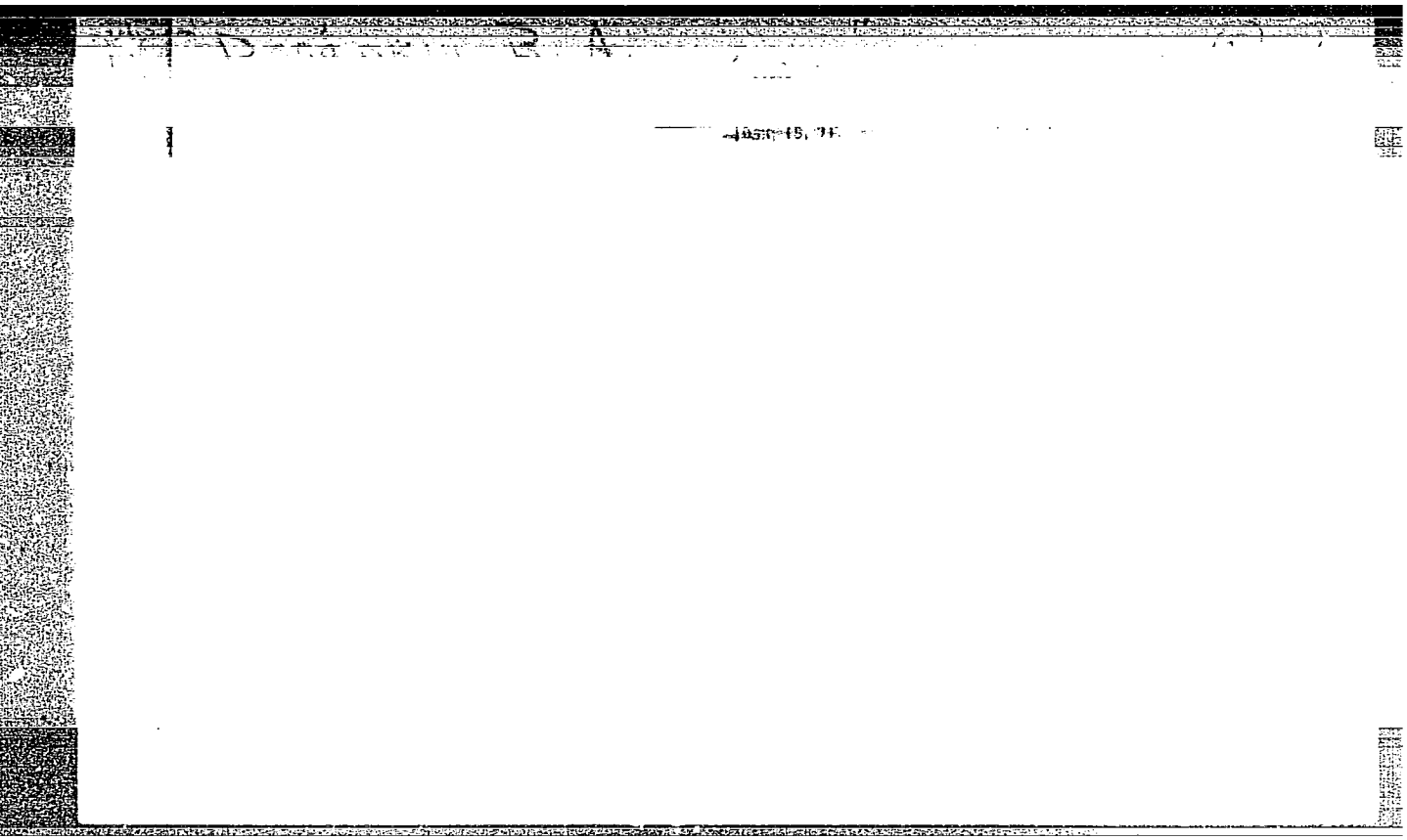
Structure and properties of loaded rubber mixtures. X. Dielectric properties of two-component carbon mixtures from sodium-butadiene rubber. Kolloid. Zhur. 15, 183-94 '53. (MLRA 6:5)
(CA 47 no.17:9043 '53)

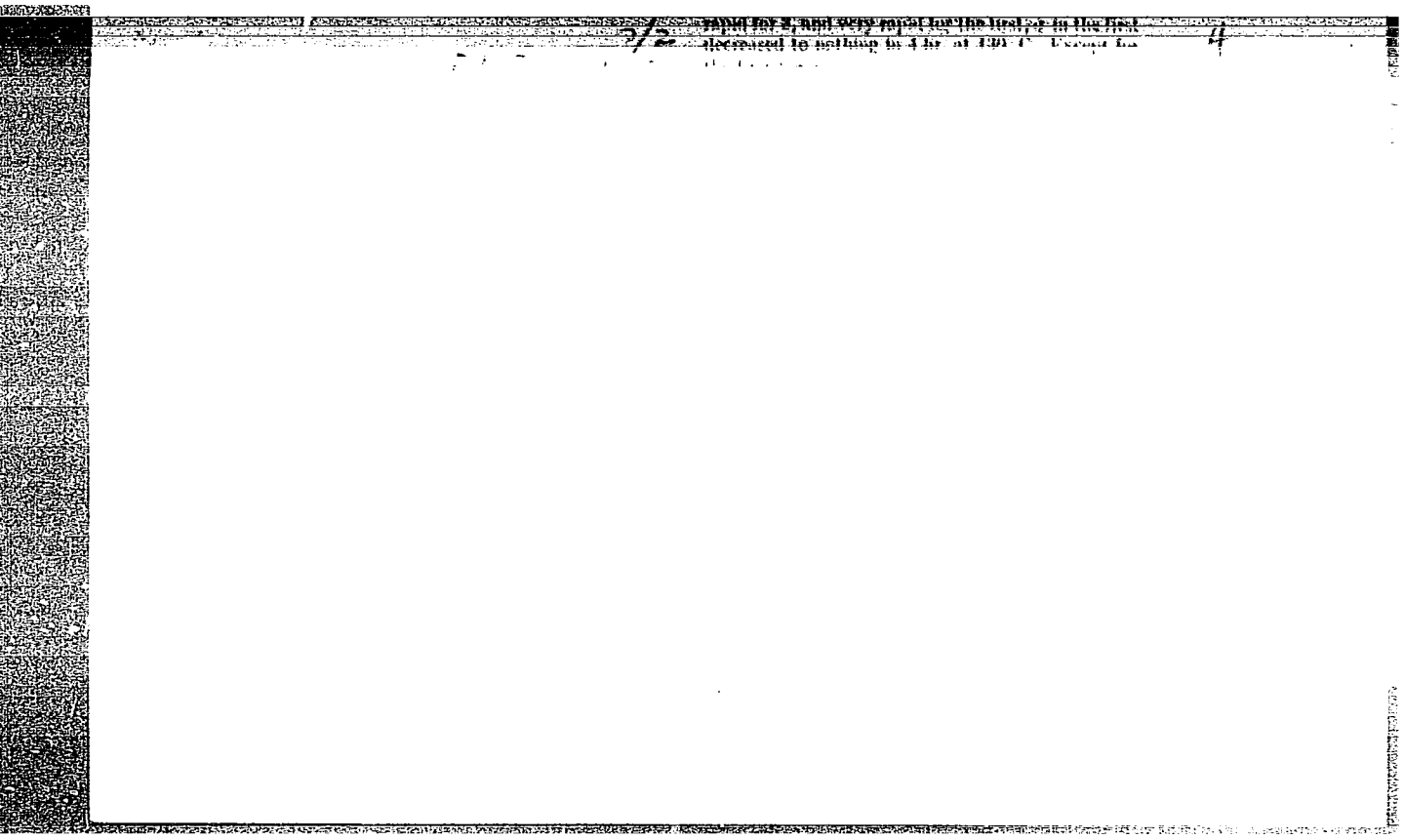
1. Sci. Research Inst., Tire Ind., Moscow.

LUKOMSKAYA, A.I.; DOGADKIN, B.A.

Structure and properties of filled rubber mixtures. Part 11. Dielectric properties of vulcanized carbon black and sodium butadiene rubber mixtures. Koll.zhur. 15 no.4:259-270 '53. (MLRA 6:8)

1. Nauchno-issledovatel'skiy institut shinnoy promyshlennosti.
(Rubber, Synthetic)





PASYNSKIY, A.G.; VASIL'YEV, P.S.; DOGADKIN, B.A.

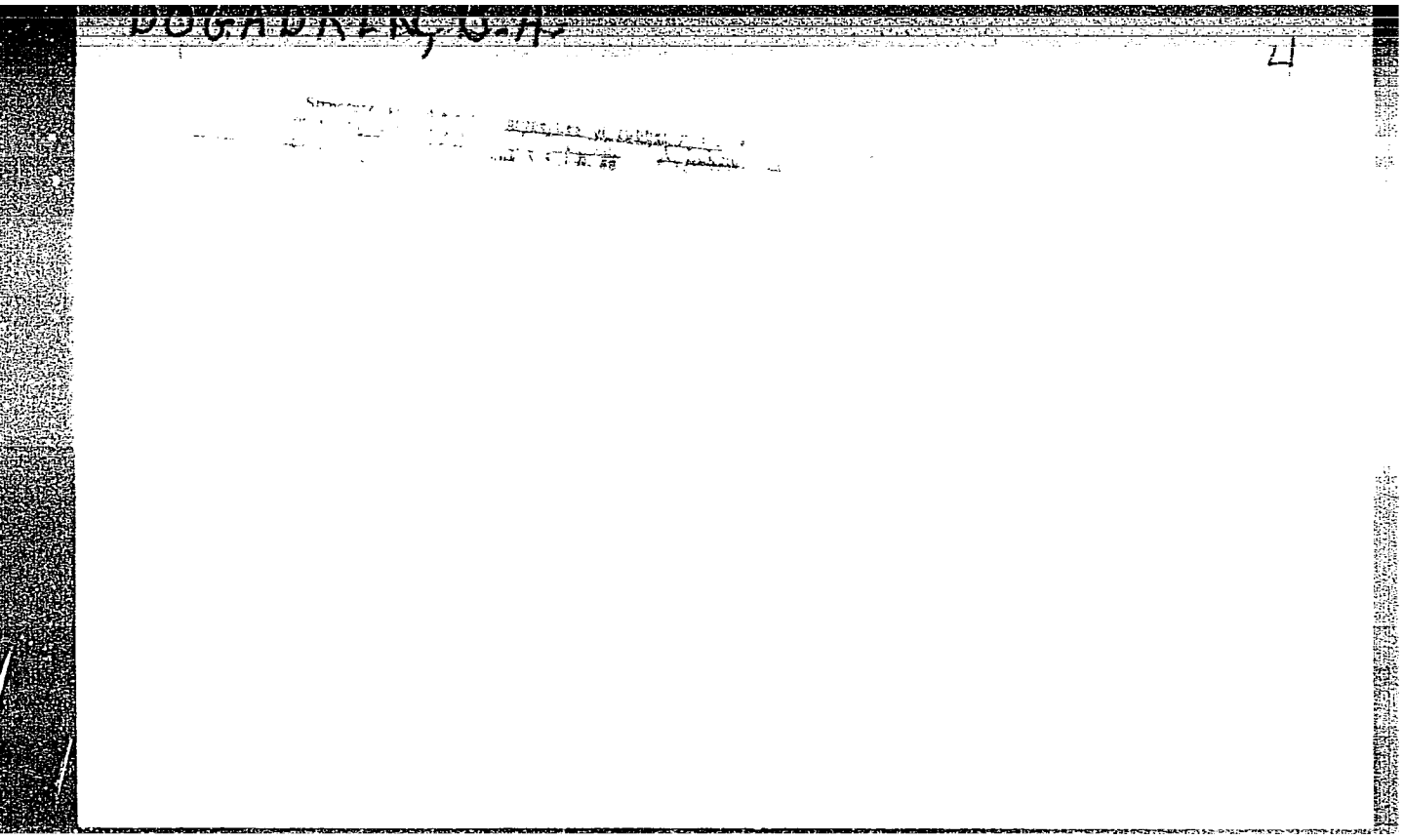
Subject matter and principles of a course in colloidal chemistry.
Koll.zhur. 15 no.6:466-472 '53. (MLRA 6:12)
(Colloids--Study and teaching)

DOGADKIN, B. A.

6

Studies of the vulcanization of rubber. X. The vulcanization of natural rubber with a mixture of sulfur dioxide and hydrogen peroxide. B. A. Dogadkin and F. Kheifets (Research Inst. Tire Ind., Moscow). *Rubber Chem. & Technol.* 26, 559–66(1953).—See C.A. 46, 8407g. C. C. Davis

10-15-54



USSR/Chemistry - Rubber; Isotopes 1 Sep 53

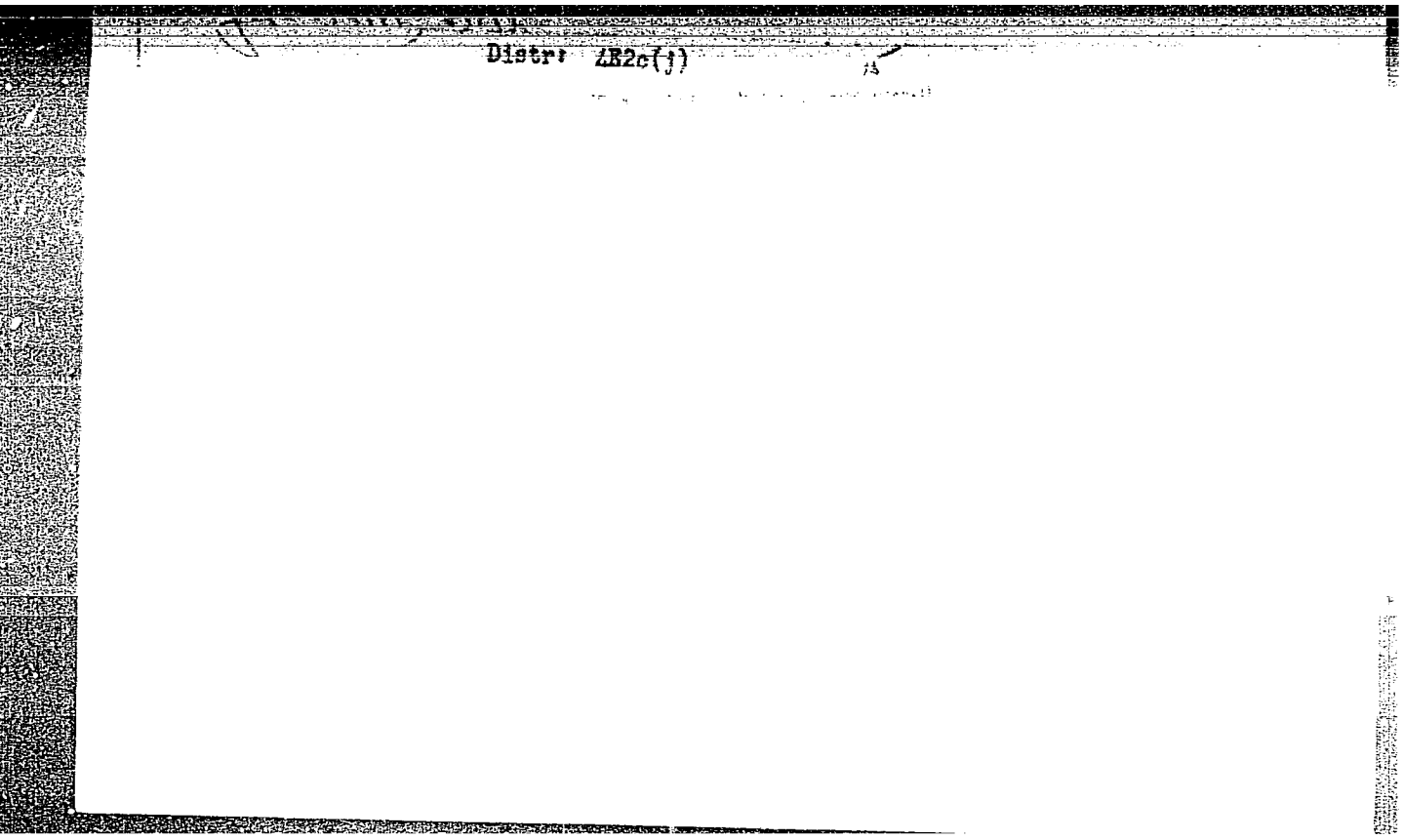
"Phenomena of Polymerization During the Vulcanization Process," B. Dogadkin, M. Fel'dshteyn, A. Dobromyslova, V. Shkurina, and M. Kaplunov, Moscow Inst of Fine Chem Technol im M. V. Lomonosov

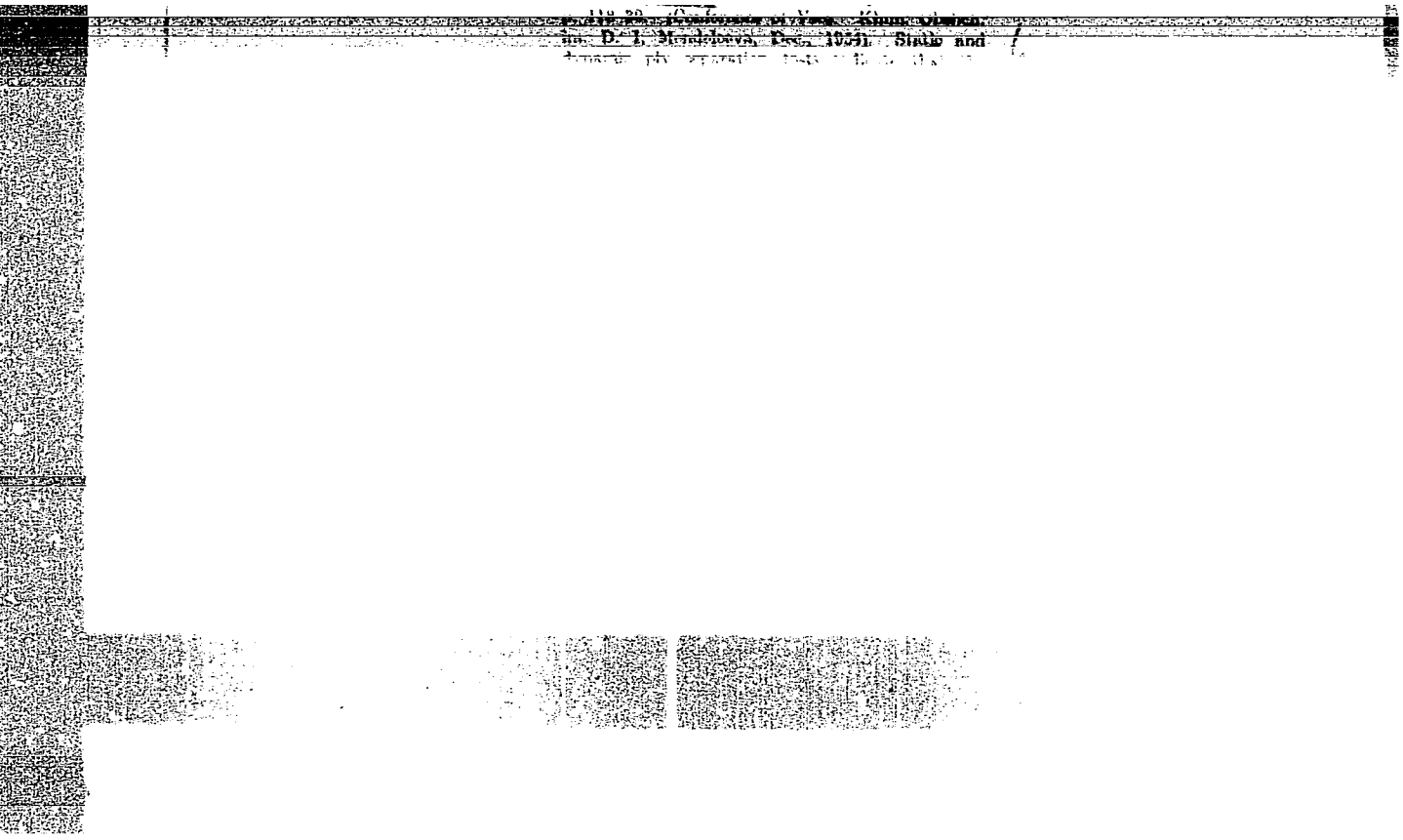
DAN SSSR, Vol 92, No 1, pp 61-64

Established that polymerization with rubber of radicals derived from accelerators takes place in vulcanization processes occurring in the presence of accelerators of the dibenzothiazoldisulfide and benzothiazoldiethylsulfenamide class. Used

274T6

radioactive S^{35} in the vulcanization agent to trace the course of the vulcanization. Presented by Acad B. A. Kazanskiy 16 Jun 53.





[redacted]

Dec. 1954). A stripline test is proposed for the [redacted]
[redacted] of [redacted] plug-up layers, to [redacted]

[redacted]

FD 197

[redacted]

LUKOMSKAYA, A.I.; DOGADKIN, B.A.

Structure and properties of filled rubber mixtures. Part 12. Dielectric properties of carbon black rubber mixtures composed of natural rubber. Koll.zhur. 16 no.1:36-43 Ja-F '54. (MLRA 7:1)

1. Nauchno-issledovatel'skit institut shinnoy promyshlennosti, Moscow.
(Rubber)

DOGADKIN, B.A.

A Study of the regularities in the deformation of loaded rubbers. M. M. Reznikovskii, L. S. Fuss, and B. A. Dogadkin (Sci. Research Inst. Tire Ind., Moscow). *Kolloid. Zhur.* 10, 211–19 (1951); cf. *C.A.* 47, 3603b.—The quasi-equiv. modulus (*E*) of elasticity of unloaded vulcanized Na-butadiene rubber (I) and butadiene-styrene rubber (II) was independent of the previous deformations. The *E* of I and II contg. 10–40 parts channel black per 100 parts rubber was, for a deformation ϵ, independent of previous deformation ϵ_1, if ϵ_1 was $< \epsilon$, and was smaller the greater the ϵ_1, if this was $> \epsilon$. The ratio of *E* to ϵ after ϵ_1 to that after no deformation was independent of the concn. of the filler. The greater was ϵ_1, the smaller was the difference between the *E* values for loaded and unloaded rubber. Between 300° and 370° Abs., *E* for loaded and unloaded rubbers was proportional to the abs. temp.; thus, *E* of loaded rubbers depended on the elasticity of the mol. chains. In confirmation of Patrikeev (1946), the stress-strain curves of loaded rubbers were independent of ϵ_1 when ϵ_1 was $< \epsilon$. Stress-strain curves of rubber strips were detd.; the stress-strain curves of the ruptured fragments were measured. These curves practically coincided with those of unloaded rubber at small ϵ values, but rose with increase of ϵ more steeply than the initial curves. The effect of ϵ_1 on *E* decayed in time, but had still 0.5 the original value after a rest of 6 months. The ratio of E_1 to *E* for 2 samples was identical to the ratio of *h* for these samples, independently of the concn. of filler where E_1 = the dynamic modulus of elasticity, *h* = the coeff. of internal friction.

I. I. Bikerman

(2)

DeGADKIN, E. A.

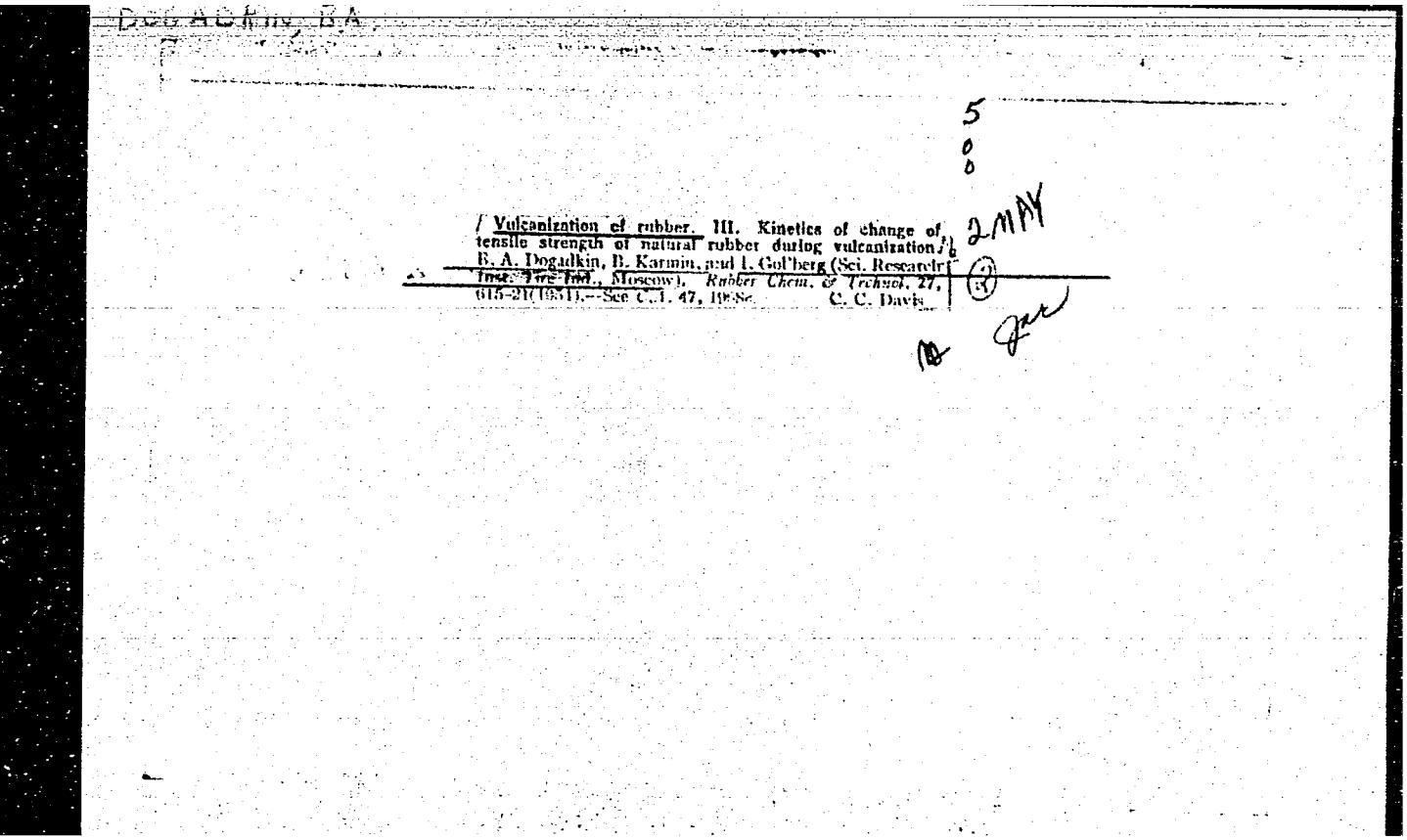
USSR

Effect of oxidation of rubber on the kinetics of its swelling. V. E. Gul, T. V. Khodzhaeva, and E. A. Degadkin (Lomonosov Inst. Fine Chem. Technol., Moscow). *Kolloid Zhur.* 16, 412–20; *Colloid J.* (U.S.S.R.) 16, 383–8 (1954) (Engl. translation).—Fresh butadiene-styrene rubber (I) contg. an antiaging compd. (Neozone D) (II) swelled in MeOH and EtOH; its mass reached a const. value of about 1.22–1.25 times the initial mass in 30 or 60 hrs., resp. After aging for *t* days at 80°, I swelled for days without reaching a const. wt., and the swelling after *t* = 8 was greater, and after *t* of 15 and 23 days was less than for fresh I. Apparently, oxidative breakdown of chains prevailed up to 8 days, while later the fragments grew together to branched chains. This was confirmed by mol.-wt. detns.; the mol. wt. from light scattering increased regularly, while the mol. wt. from viscosity detns. decreased when *t* increased. The percentage of gel fraction reached a min. after *t* = 8. When II and sol. products were removed from fresh I by MeOH (in 10 days), swelling in MeOH became limitless and almost as great as after *t* = 8. Also fresh smoked-sheet rubber (III) had a swelling limit in MeOH (e.g., 1.06 the initial mass), which disappeared when III was heated for several days at 80° or purified by dissolving in C_6H_6 and pptg. The increase of swelling after aging was due to accumulation of oxidation products in III; this accumulation was demonstrated also by the shortening of the induction period for air oxidation of III at 143°; the induction period was 10 hrs., 4 hrs., and 0 hr. for fresh III and III after 9 and 20 days' aging, resp. The mol. wt. of fresh III was 380,000 by both methods; after 20 days' aging it was 100,000 (light scattering) or 210,000 (viscosity). J. J. Bikerman

Dogadkin, B. A.

USSR

The vulcanization of rubber. XI. Influence of the degree of vulcanization on the internal friction of unloaded butadiene-styrene vulcanizates. M. M. Reznikovskii, V. S. Yurovskaya, and B. A. Dogadkin (Sci. Research Inst. Tire Ind., Moscow). *Rubber Chem. & Technol.* 27, 415-20 (1954).—See *C.A.* 47, 3013*h*. C. C. Davis



DOGADKIN, B.A.

500

/ Vulcanization of rubber. III. Kinetics of change of tensile strength of natural rubber during vulcanization. / B. A. Dogadkin, B. Karmin, and I. Gol'berg (Sci. Research Inst. Tire Ind., Moscow). *Rubber Chem. & Technol.* 27, 615–21 (1954).—See C.A. 47, 10858. C. C. Davis

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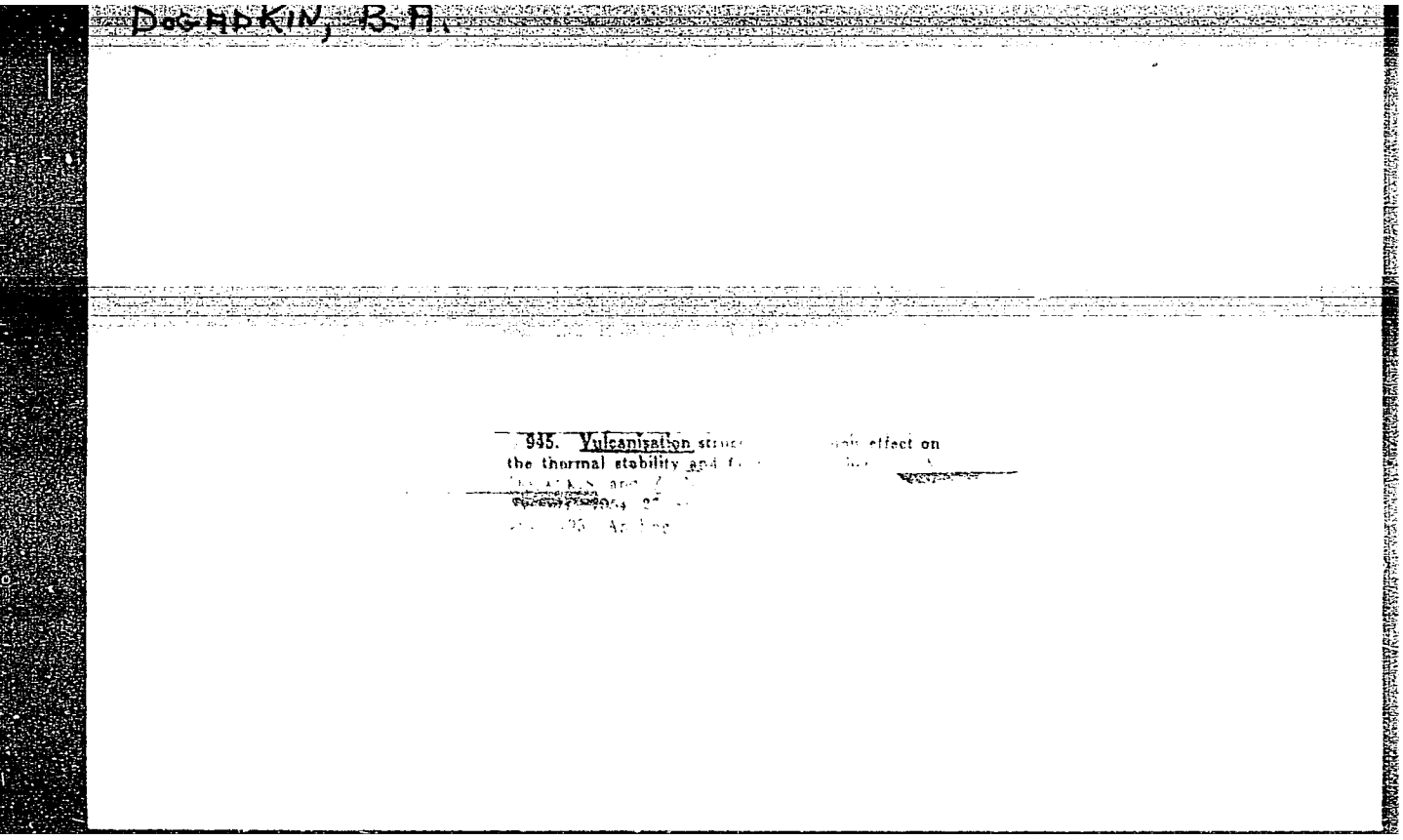


DOGADKIN, B. A.

945. Vulcanization stru[illegible] effect on
the thermal stability and f[illegible]

USSR/ Chemistry - Synthetic rubber

Card 1/1 Pub. 22 - 40/56

Authors : Tarasova, Z.; Kaplunov, M.; and Dogadkin, B.

Title : Interchange reactions in vulcanized rubber

Periodical : Dok. AN SSSR 99/5, 819-822, Dec 11, 1954

Abstract : Two types of vulcanized butadiene styrene rubber one of which contained S, diphenylguanidine and ZnO and the other - tetramethylthiuramdisulfide and ZnO were investigated to determine the interchange reactions occurring in vulcanized rubber. The method employed in the study of interchange reactions, is described. It was established that the S in polysulfide bonds of vulcanized rubber enter into an isotopic exchange with the radioactive S whereas S in mono- and disulfide bonds will not submit to interchange. The relative S-content in polysulfide bonds is determined by the interchange intensity of the sulfur bound in the vulcanized rubber. Six references: 4-USSR; 1-USA and 1-English (1944-1954). Table; graphs

Institution: Scientific Research Institute of Tire Industry

Presented by: Academician V. A. Korgin, June 22, 1954

USSR/Chemistry - Elastomers Dogadkin, B. A. FD-2725

Card 1/1 Pub. 50 - 6/20

Authors : Khodzhayeva, I. V., Gul', B. Ye., Dogadkin, B. A.

Title : Methods for the evaluation of the quality of butadiene-styrene rubbers

Periodical : Khim. prom. No 5, 272-277, Jul-Aug 1955

Abstract : Propose two methods for the evaluation of the quality of the butadiene-styrene rubber SKS-30: on the basis of the non-equilibrium elasticity modulus of the crude rubber at 100% elongation (M_{100}) and on the basis of the index of creeping. Five graphs, 3 tables. Six references; 3 USSR, all since 1940.

Institution : Moscow Institute of Fine Chemical Technology imeni M. V. Lomonosov

Dogadkin, B. A.

K Anton Vladimirovich Dumanskii—seventy-five years old. [B. A. Dogadkin, S. M. Lipatov, and P. A. Rebinder.] *Kol. Zhur.* 17, 161–7(1955).—Biography with portrait and list of publications. J. J. Bikerman

(2)

DOGADKIN, B. A.

Theory of vulcanization and the action of accelerators. B. A. Dogadkin, V. Selyukova, Z. Tarasova, A. Dobromyslova, M. Berlin, and M. Kaplunov (Inst. Fine Chem. Technol., Moscow). *Kolloid Zhur.* 17, 215–20(1955); cf. C.A. 48, 10176c.—Na-butadiene rubber (I) was vulcanized by heating at 143° with (e.g., 6%) benzothiazolyl disulfide (II) in toluene in N; e.g., after heating for 9 hrs., the mol. wt. was 300,000 when the initial mol. wt. was 100,000, and the S concn. was 0.1%; about 40% of the initial II was decompd., and about 0.5 the decompd. II was transformed into mercaptobenzothiazole. An analogous vulcanization in the solid state gave, in 0 hrs., a product with elasticity modulus *E* of 5 kg./sq. cm. The rate of stress relaxation of these vulcanizates was increased by substituting S for a part of II; this showed that, in the reaction between I and II, more stable C—C bonds form, while the reaction between I and S results in less stable —S—S— bonds. The no. of bonds produced by 1 mol. of II attached to I was 1.1–5.4. The mechanism of this bond formation is discussed. Heating of isoprene (III) with II at 125° caused about 30% polymerization of III. When I was vulcanized with a mixt. of S and II, the rate of reaction increased linearly with the ratio of II to I. The increase of *E* with the S content of the vulcanizate was greater, the greater the proportion of the 1,4-isomer in I. The S of the vulcanizate, by using S^{35}, was shown to exchange with the S in II or with free S. The reactions of the α-CH$_2$ group of rubber chains are very important for vulcanization.

J. J. Bikerman

(5)

Доклад, В 4

LIPATOV, S.M.

Comments on the paper: "The subject matter and principles of a course in colloid chemistry". Koll. zhur. 17 no.4:324-327 Jl-Ag'55. (MIRA 8:11)
(Pasynskii, A.G.) (Vasil'ev, P.S.) (Dogadkin, B.A.) (Colloids--Study and teaching)

DOGADKIN, B. A.

USSR.

2197. Use of radioactive sulphur for the study and control of the vulcanisation process. Z. N. Tarasova, M. Ya. Kaplunov and B. A. Dogadkin (*Zavod. Lab.*, 1955, 21 [4], 396–397).—To determine combined sulphur in rubber during manufacture, a proportion of the ^{35}S isotope is added to the vulcanising agent and the β-radiation intensity of discs 20 mm in diameter (0·3 mm thick for soft rubber) is measured with a Geiger - Müller counter after the free sulphur has been removed with hot acetone. The combined sulphur content is read from a calibration graph. The mean error is about 1 per cent. The operational time for a determination is only 8 to 10 min., but the extraction of the free sulphur takes 50 hr. G. S. Smith

Naucho-issledovatel'skiy insitut shinnoy promyshlennosti.

DOGADKIN, B. A.

3

Formation and properties of network polymers. B. A. Dogadkin and M. M. Reshetkovskii. *Uspekhi Khim.* 24, 801–14(1955).—A review of phys. and chem. properties and modes of formation of tridimensional polymers, specifically rubber materials, covering the period through 1954, with 70 references. G. M. Kosolapoff

MT

pm (1) MA

DOGADKIN, B.

AID P - 3427

Subject : USSR/Chemistry

Card 1/1 Pub. 152 - 12/18

Authors : Dogadkin, B., M. Fel'dshteyn, and D. Pevzner

Title : Vulcanization of butadiene-styrene rubber in the presence of sulfenamide accelerators

Periodical : Zhur. prikl. khim., 28, 5, 533-542, 1955

Abstract : Experiments with benzothiazolesulphenodiethylamide showed that this accelerator exerts a higher vulcanizing action than sulfur. The effect of benzothiazolesulphenamide and of sulfur mixtures is discussed. Eleven diagrams, 5, references, 2 Russian (1947-1953).

Institution : Scientific Research Institute of the Tire Industry.

Submitted : Ag 10, 1953

Dogadkin, B.A.

15

Rubber mixtures. P. I. Zakharchenko, A. [illegible] Suslyak[illegible], B. A. Dogadkin, and L. G. Senatorskaya. U.S.S.R. 107 667, Apr. 30, 1956. A preheated latex is continually fed [illegible] a tube together with an aq. dispersion of the necessary [illegible]ditives such as C black, ZnO, S, and accelerators [illegible] electrolyte, and all the ingredients are [illegible] matter within the tube. The coagulation [illegible] [illegible] is washed [illegible] worked into the compn. can be used as [illegible] of the aq. dispersions of the powd. chemicals. M. Hosch

DOGADKIN, B.A.

REBINDER, P.A., akademik, otvetstvennyy redaktor; YERMOLENKO, N.F., otvetstvennyy redaktor; KARGIN, V.A., akademik, redaktor; DUMANSKIY, A.V., redaktor; DERYAGIN, B.V., redaktor; DOGADKIN, B.A., professor, redaktor; FUKS, G.I., redaktor; YEGOROV, N.G., redaktor izdatel'stva; MOSKVICHEVA, N.I., tekhnicheskiy redaktor

[Proceedings of the Third All-Union Conference on Colloidal Chemistry] Trudy Tret'ei Vsesoiuznoi konferentsii po kolloidnoi khimii. Moskva, Izd-vo Akademii nauk SSSR, 1956. 494 p. (MLRA 9:11)

1. Vsesoyuznaya konferentsiia po kolloidnoy khimii, 3d, Minsk, 1953.
2. Chlen-korrespondent AN SSSR (for Dumanskiy, Deryagin) 3. Deystvitel'nyy chlen AN SSSR (for Yermolenko)
(Colloids)

DOGADKIN, B. A.; Lukomskaya, A. I.

"Dielectric Properties of Filled Rubbers and the Problem of Reinforcing Natural Rubber" (Dielektricheskiye stoystva napolnennykh rezin i problema usileniya kauchuka) from the book Trudy of the Third All-Union Conference on Colloid Chemistry, pp. 363-370, Iz. AN SSSR, Moscow, 1956

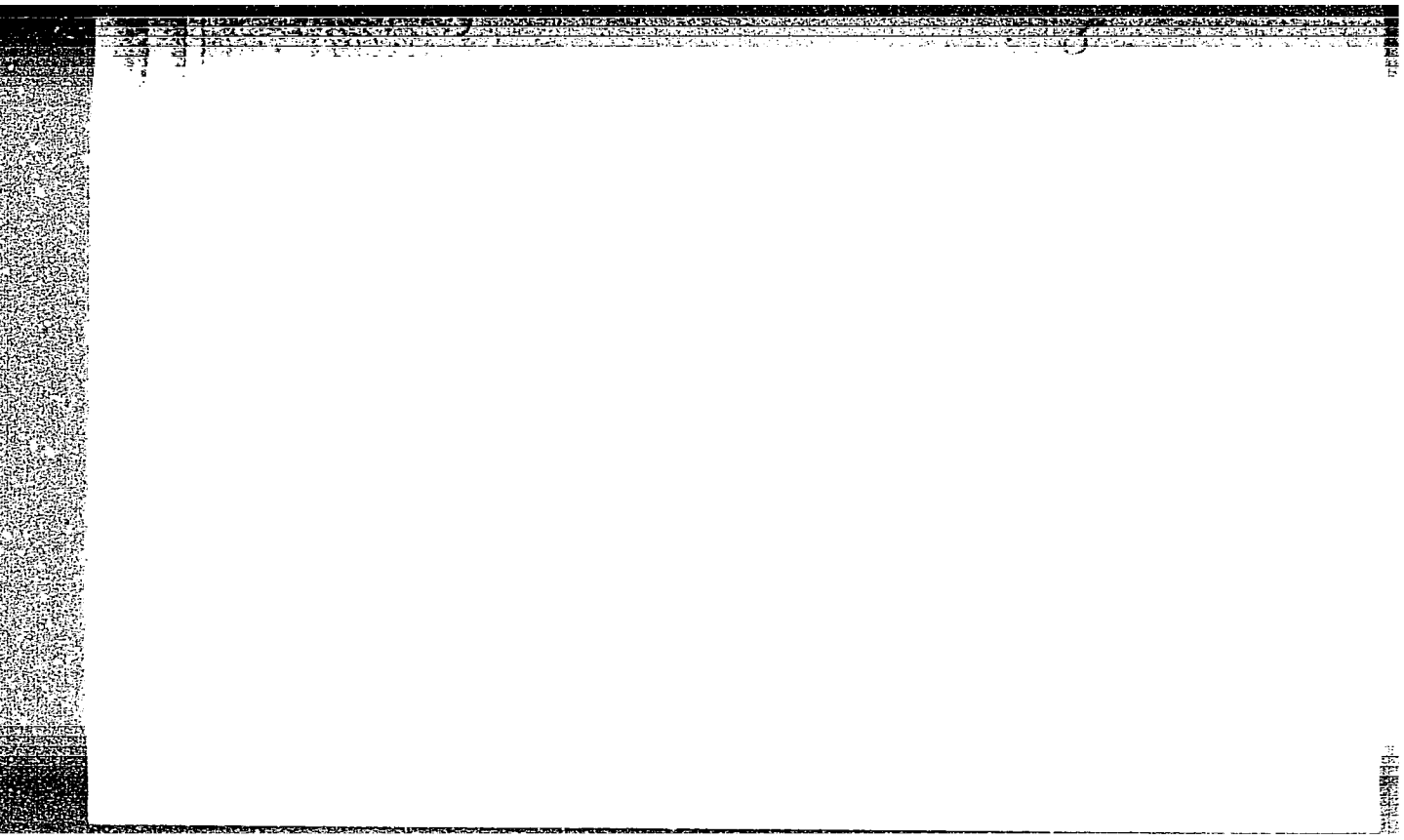
(Report given at above Conference, Minsk, 21-4 Dec 53)

Authors: Moscow Scientific Research Institute of the Tire Industry

DOGADKIN, B. A.; Pechkovskaya, K. A.

"Structure of Carbon Rubbers and Its Change under the Influence of Deformation and Heating" (Struktura sazhevykh rezin i yeye izmeneniya pod vliyaniyem deformatsii i nagrevaniya) from the book Trudy of the Third All-Union Conference on Colloid Chemistry, pp. 371-379, Iz. AN SSSR, Moscow, 1956

(Report given at above Conference, Minsk, 21-4 Dec 53)



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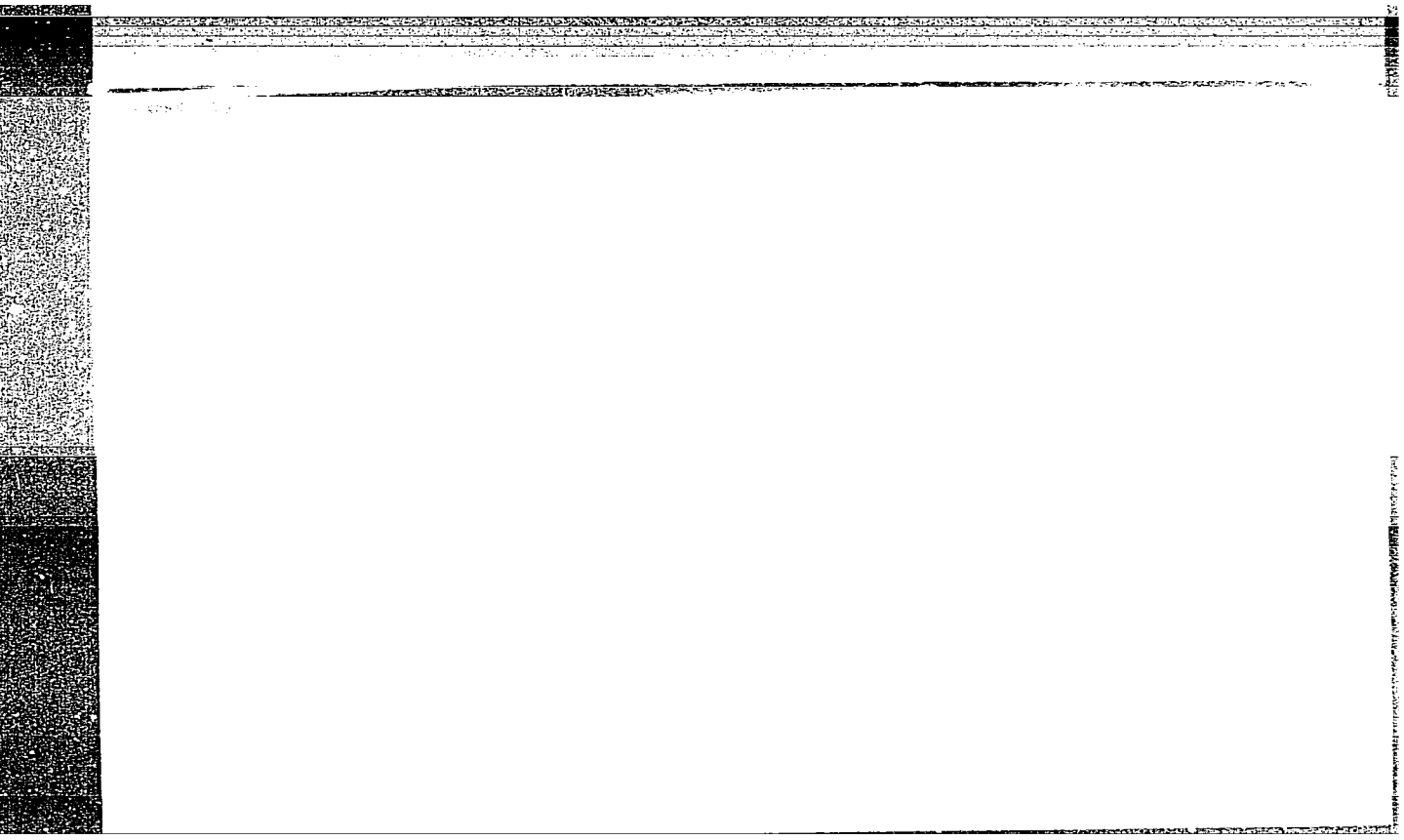

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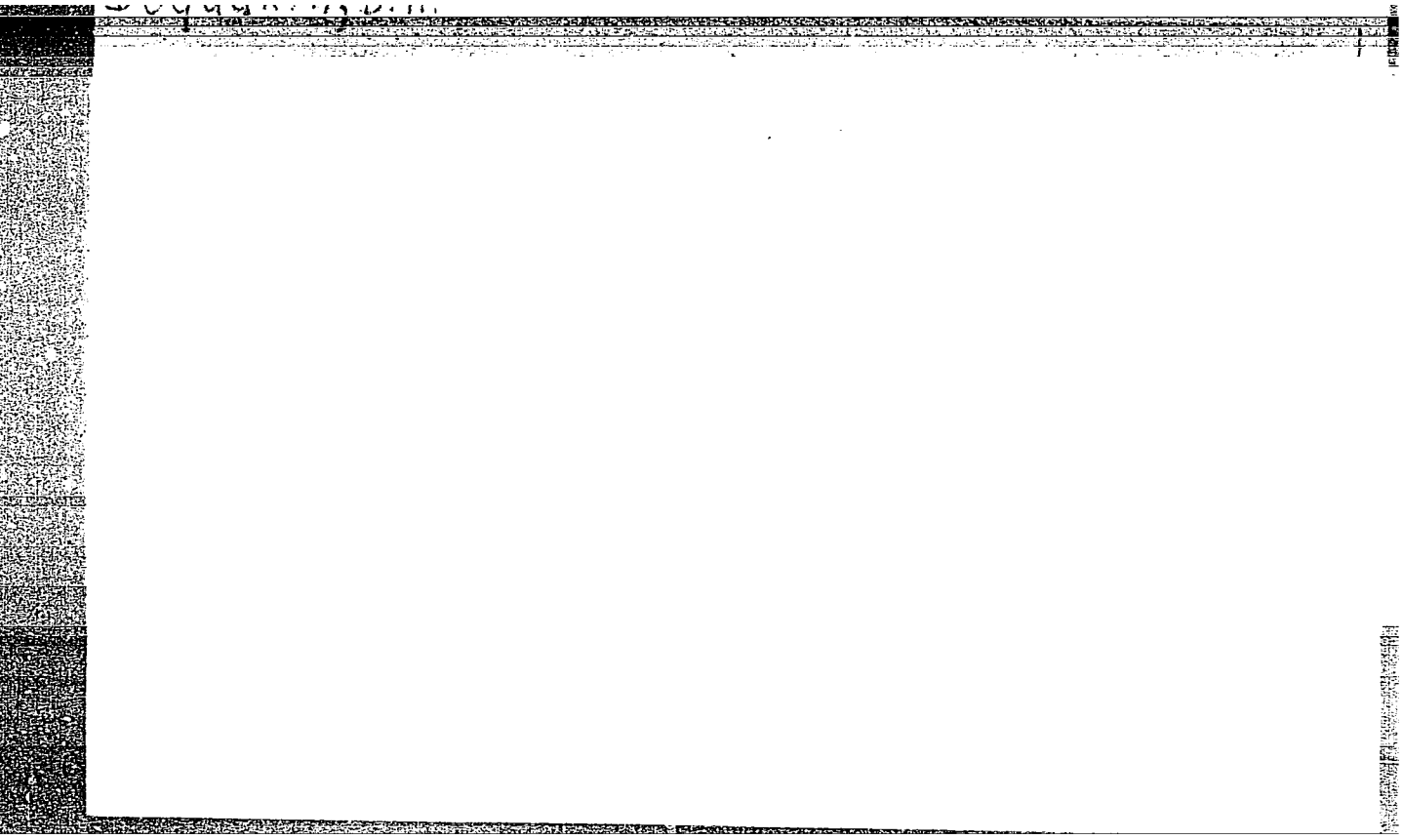

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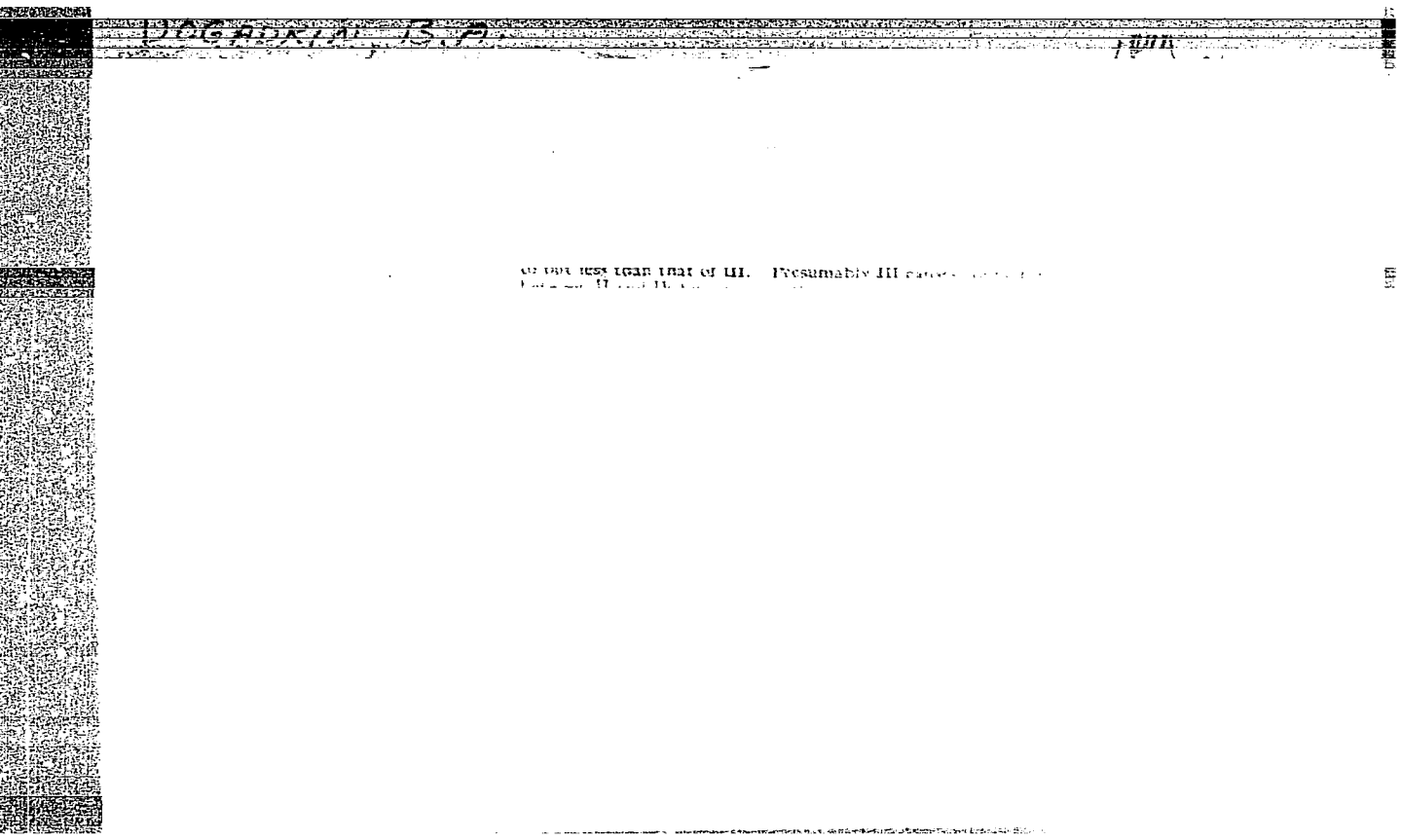

DOGADKIN, B.A.

PRIKHOT'KO, A.F.

24(7) p 3 PHASE I BOOK EXPLOITATION SOV/1365

L'vov. Universytet

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Additional Sponsoring Agency: Akademiya nauk SSSR. Komissiya po spektroskopii. Ed.: Gazer, S.L.; Tech. Ed.: Saranyuk, T.V.; Editorial Board: Landsberg, G.S., Academician (Resp. Ed., Deceased), Neporent, B.S., Doctor of Physical and Mathematical Sciences, Fabelinskiy, I.L., Doctor of Physical and Mathematical Sciences, Fabrikant, V.A., Doctor of Physical and Mathematical Sciences, Kornitskiy, V.G., Candidate of Technical Sciences, Rayskiy, S.M., Candidate of Physical and Mathematical Sciences, Klimovskiy, L.K., Candidate of Physical and Mathematical Sciences, Milyanchuk, V.S., Candidate of Physical and Mathematical Sciences, and Glauberman, A. Ye., Candidate of Physical and Mathematical Sciences.

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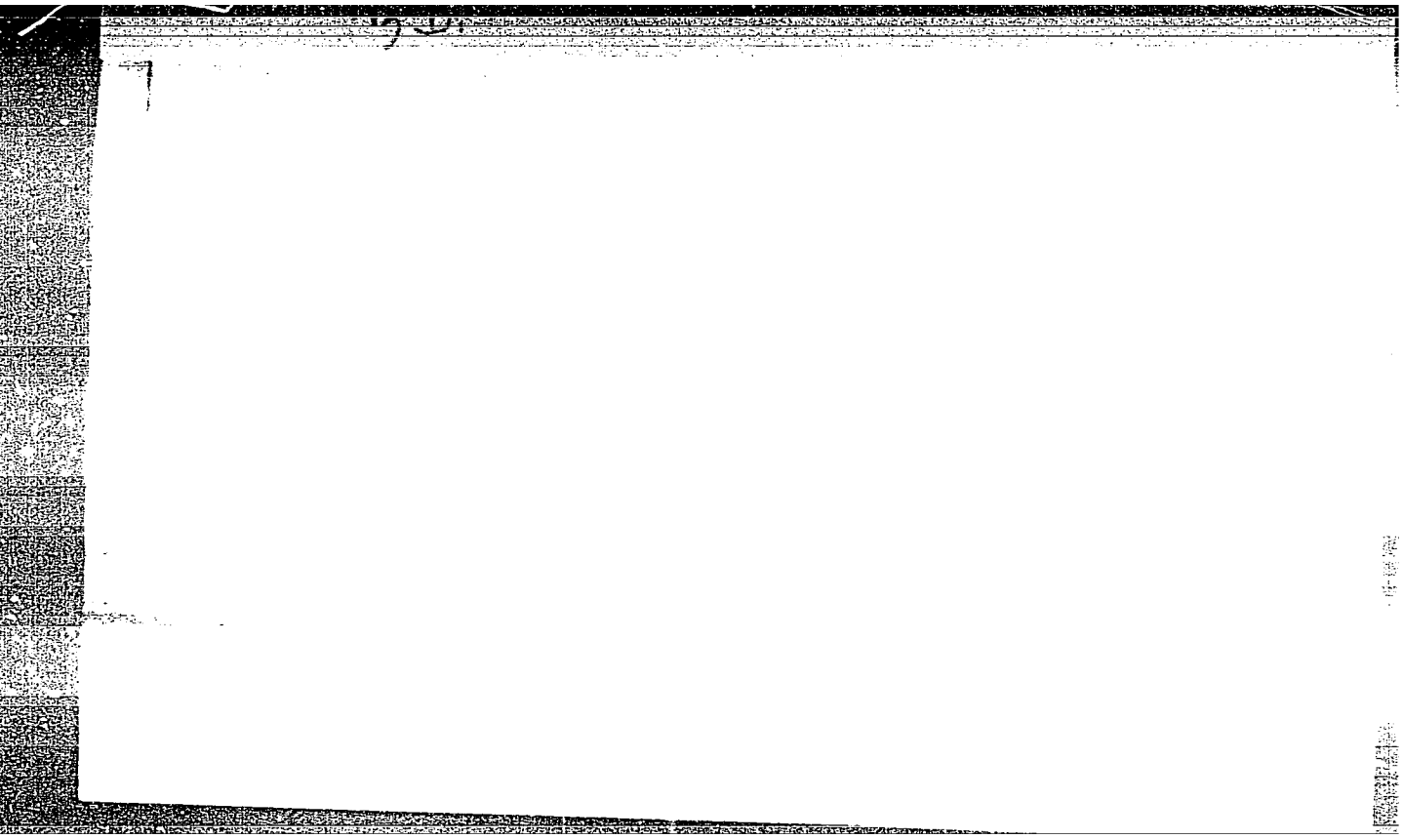

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DOGADKIN, B. A., Lomonosov Institute of Chemical Technology, Moscow

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B-3,084,395

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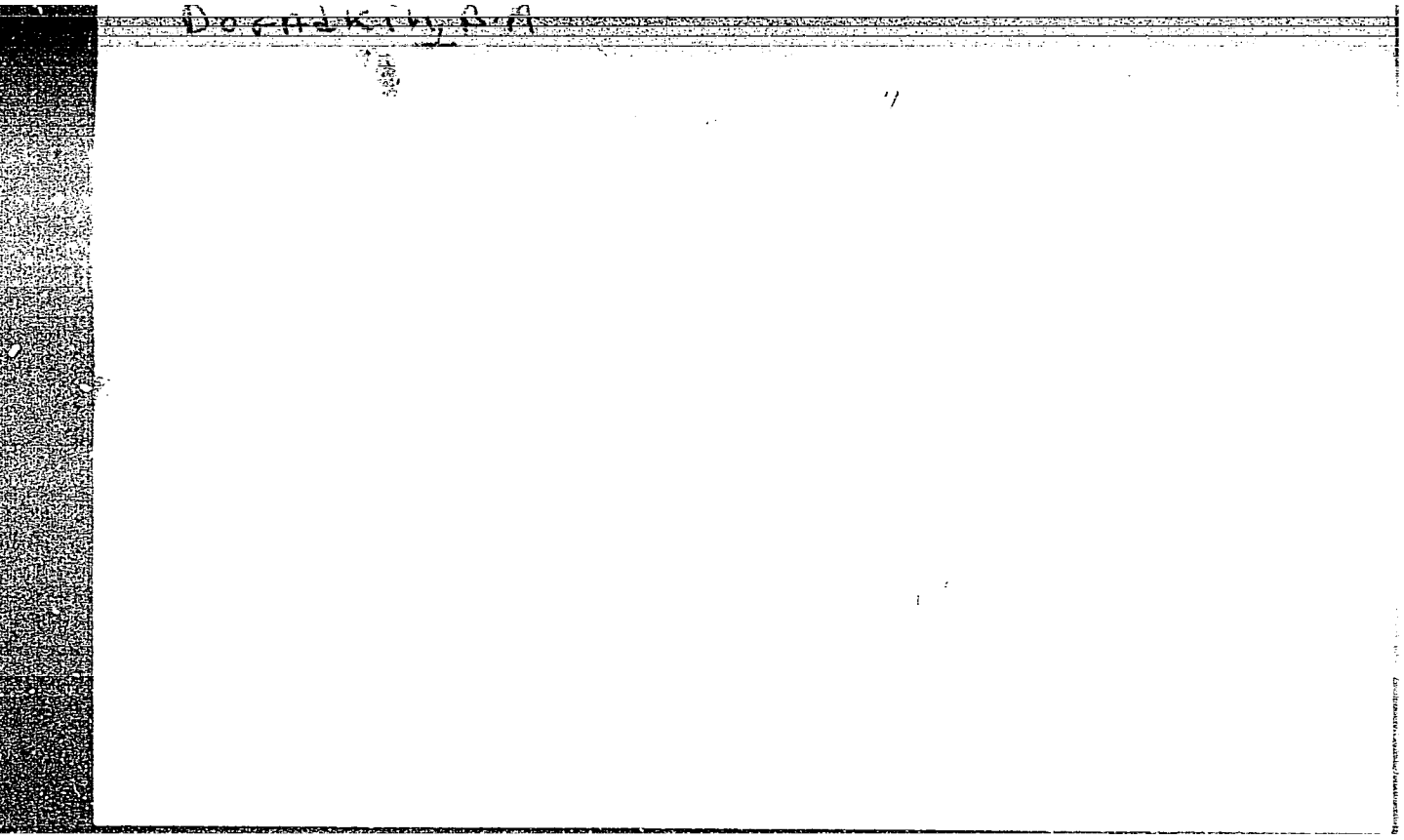
Vogadkin, B.A.



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"Structure and Properties of Vulcanized Rubbers Obtained by the Action of Nuclear Radiation"

Truly Transactions of the First Conference on Radioaction Chemistry, Moscow, Izd-vo AN SSSR, 1958. 330pp.
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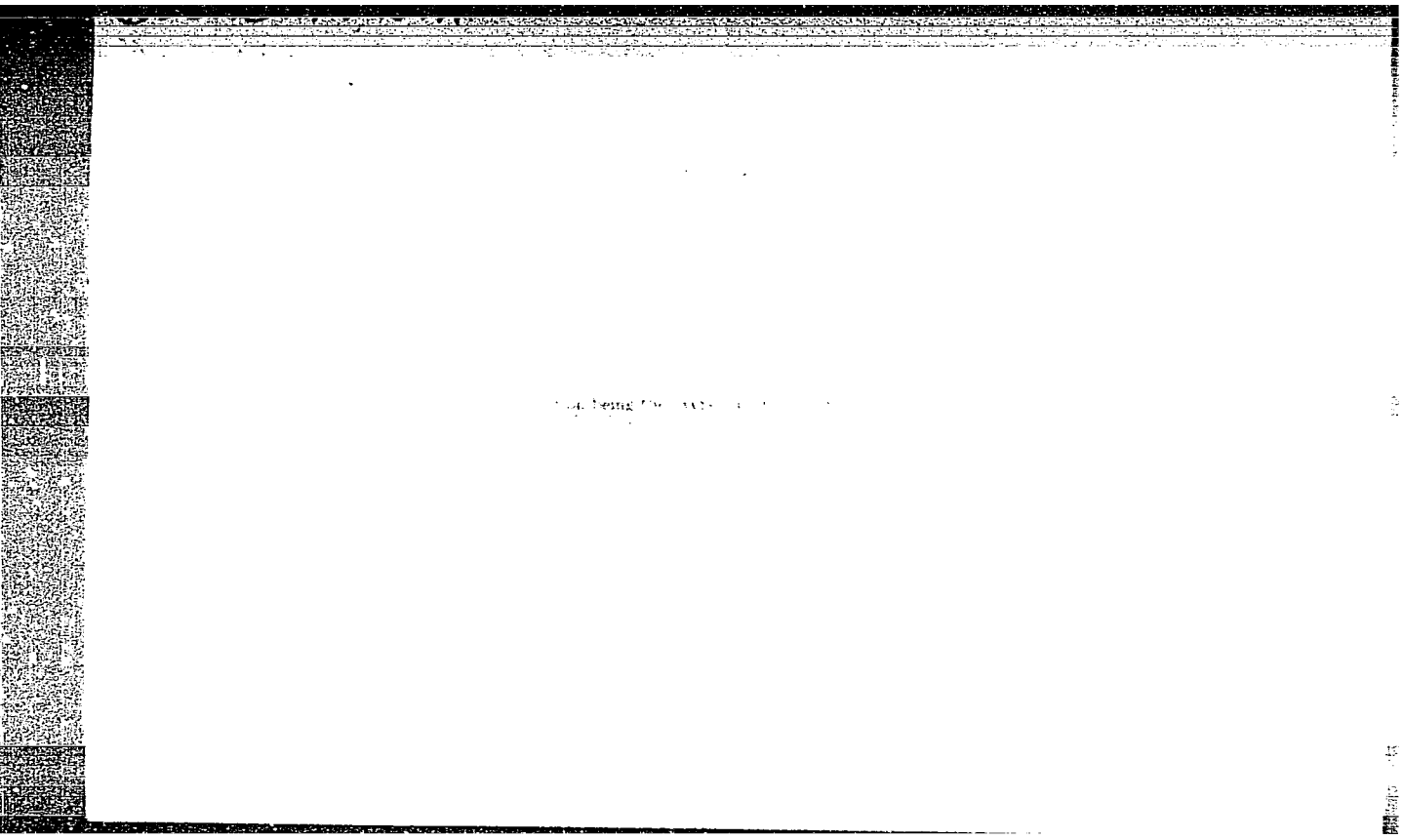
DOGADKIN B. A

DOGADKIN, B.; PECHKOVSKAYA, K.; GOL'DMAN, E.

Structure and properties of filled rubber mixtures. Part 16: Mixtures from butadiene-Na rubber with colloidal silica. Kauch. i rez. 16 no.8: 1-5 Ag '57. (MIRA 10:11)

1. Nauchno-issledovatel'skiy institut shinnoy promyshlennosti.
(Rubber, Synthetic) (Silicic acid)



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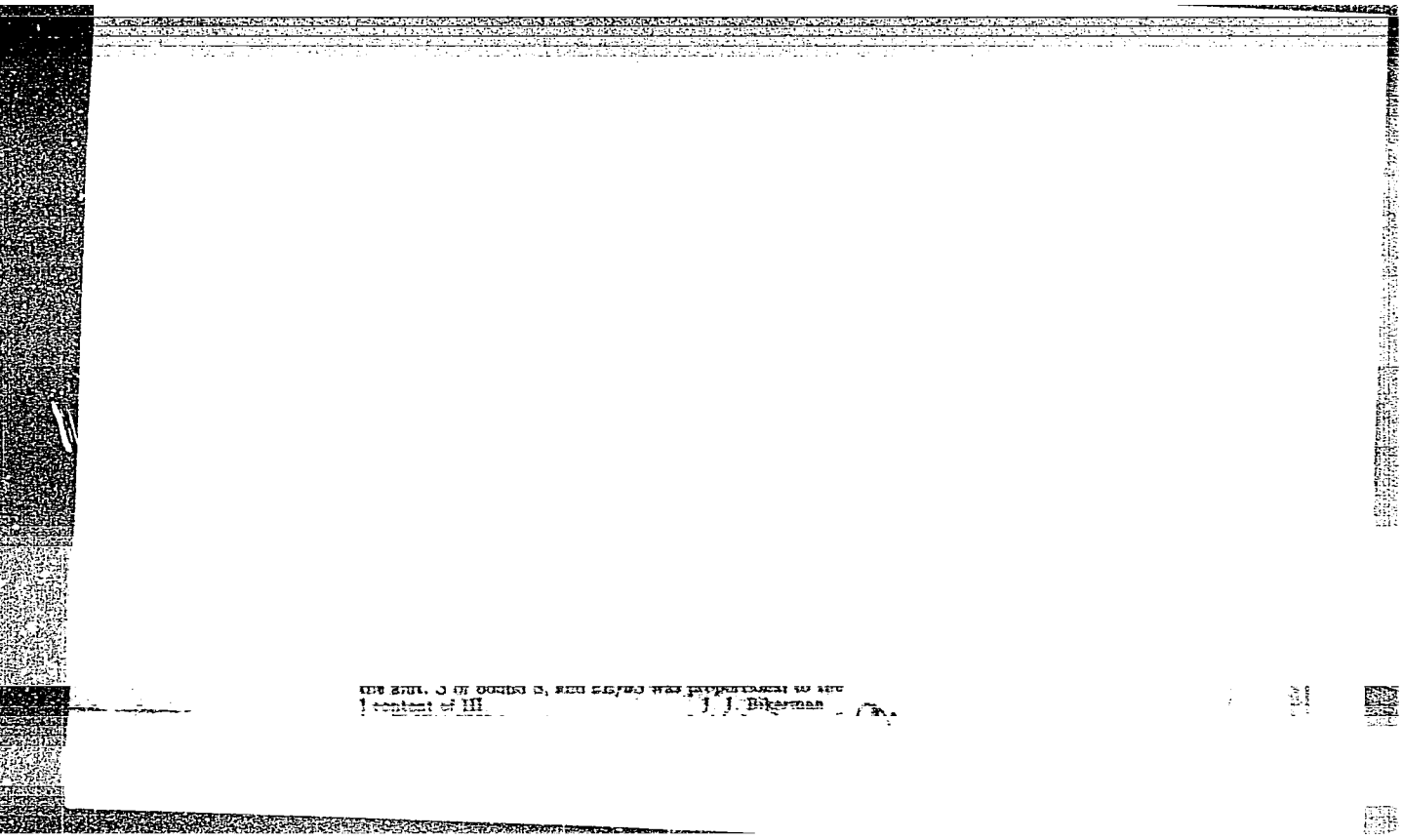

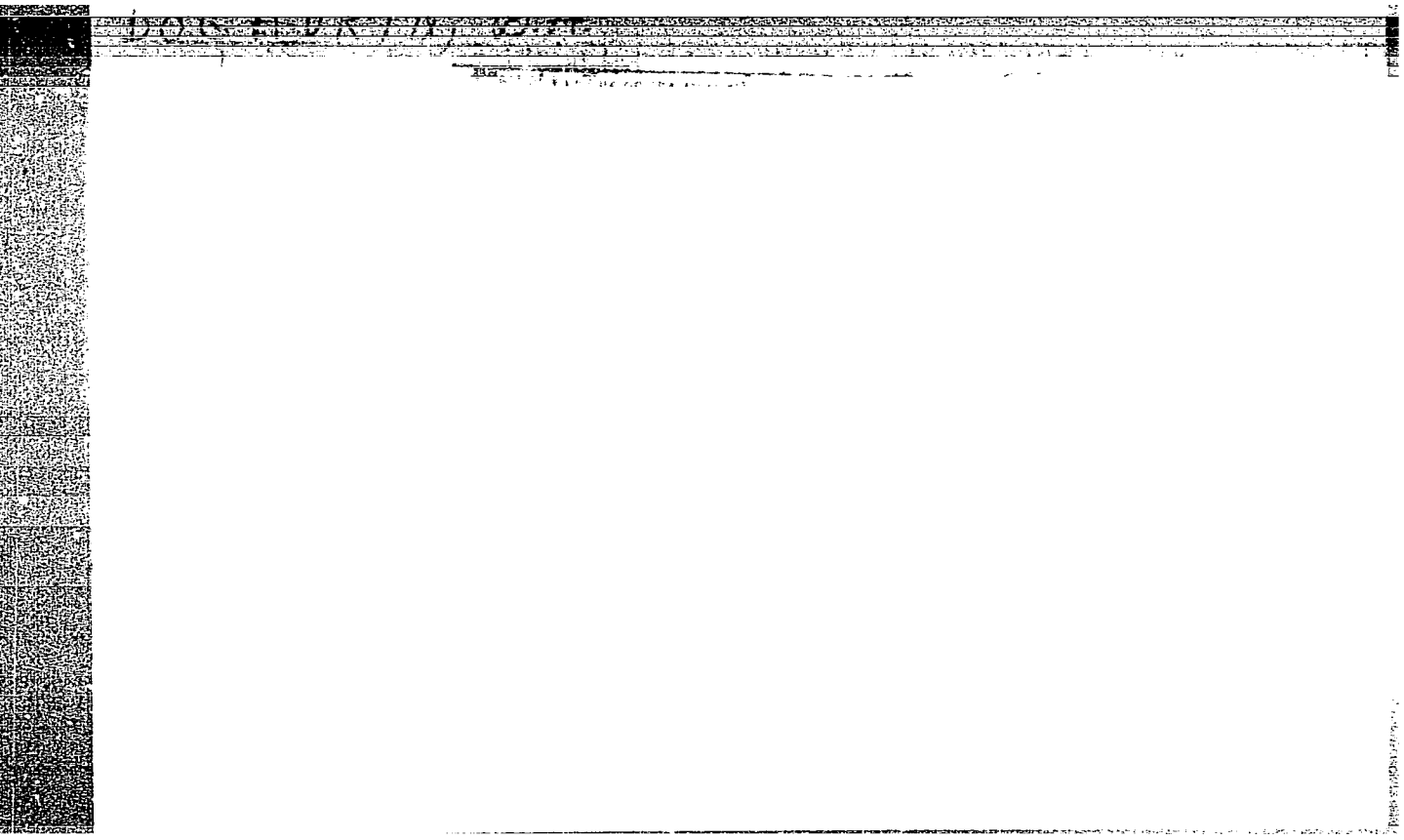

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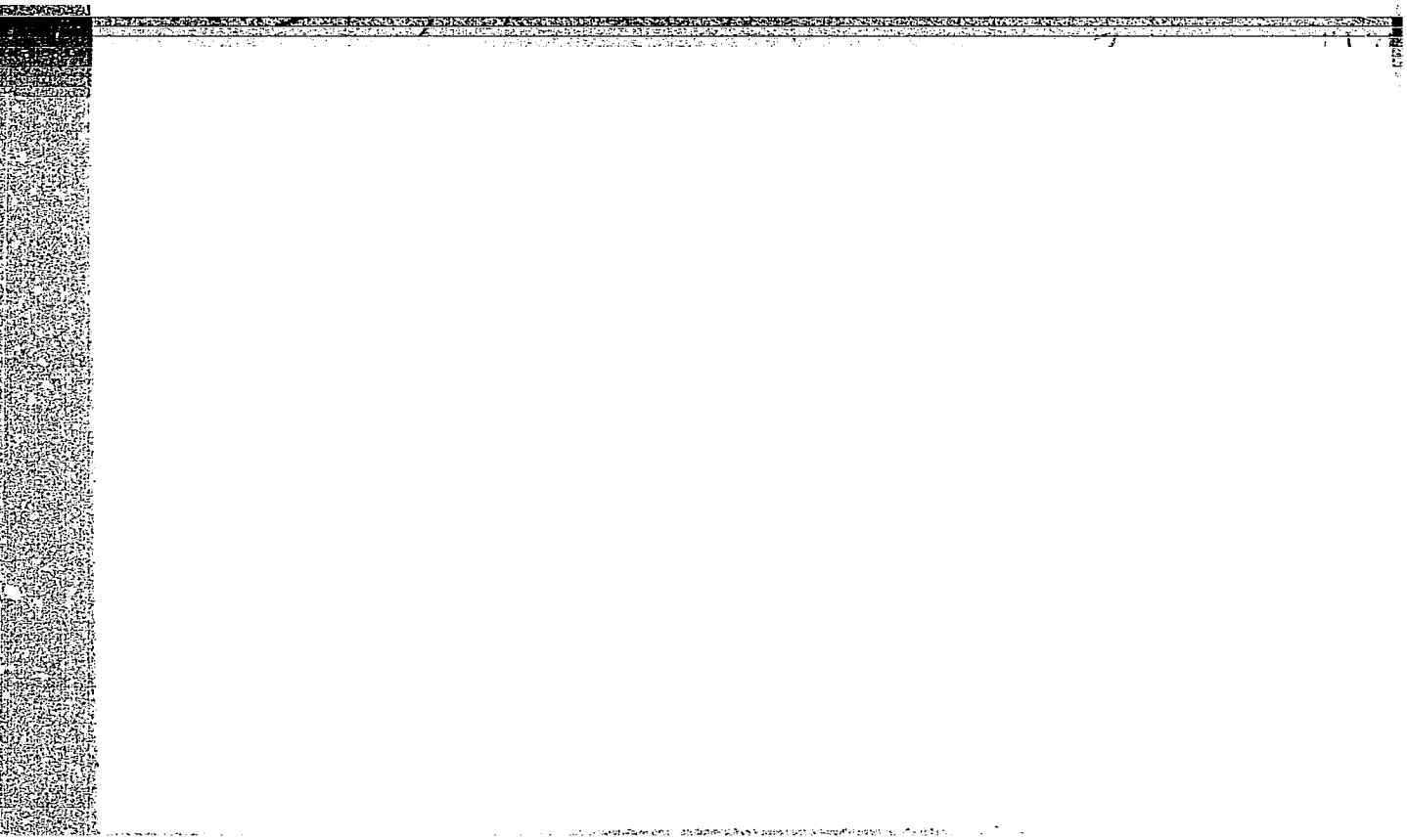

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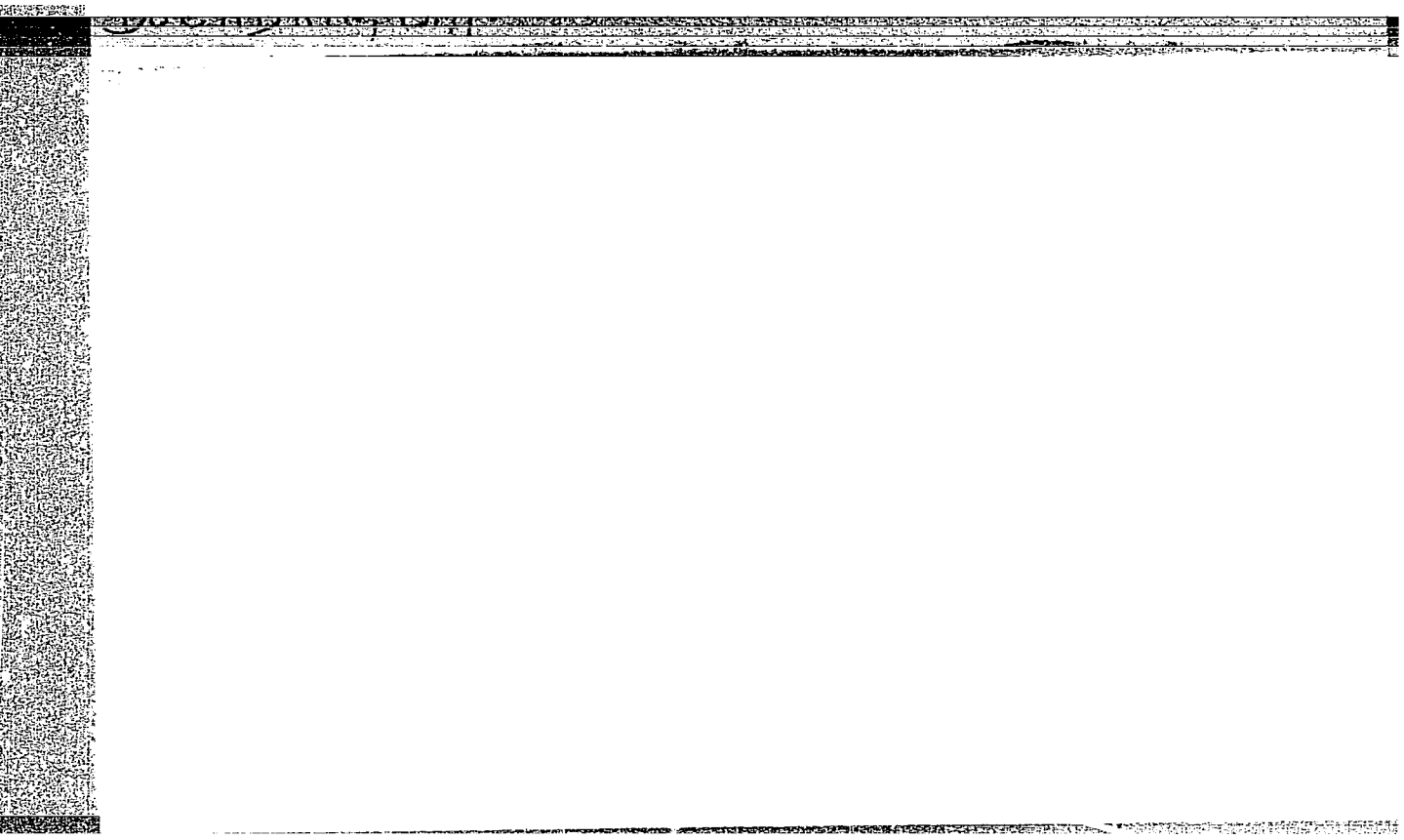

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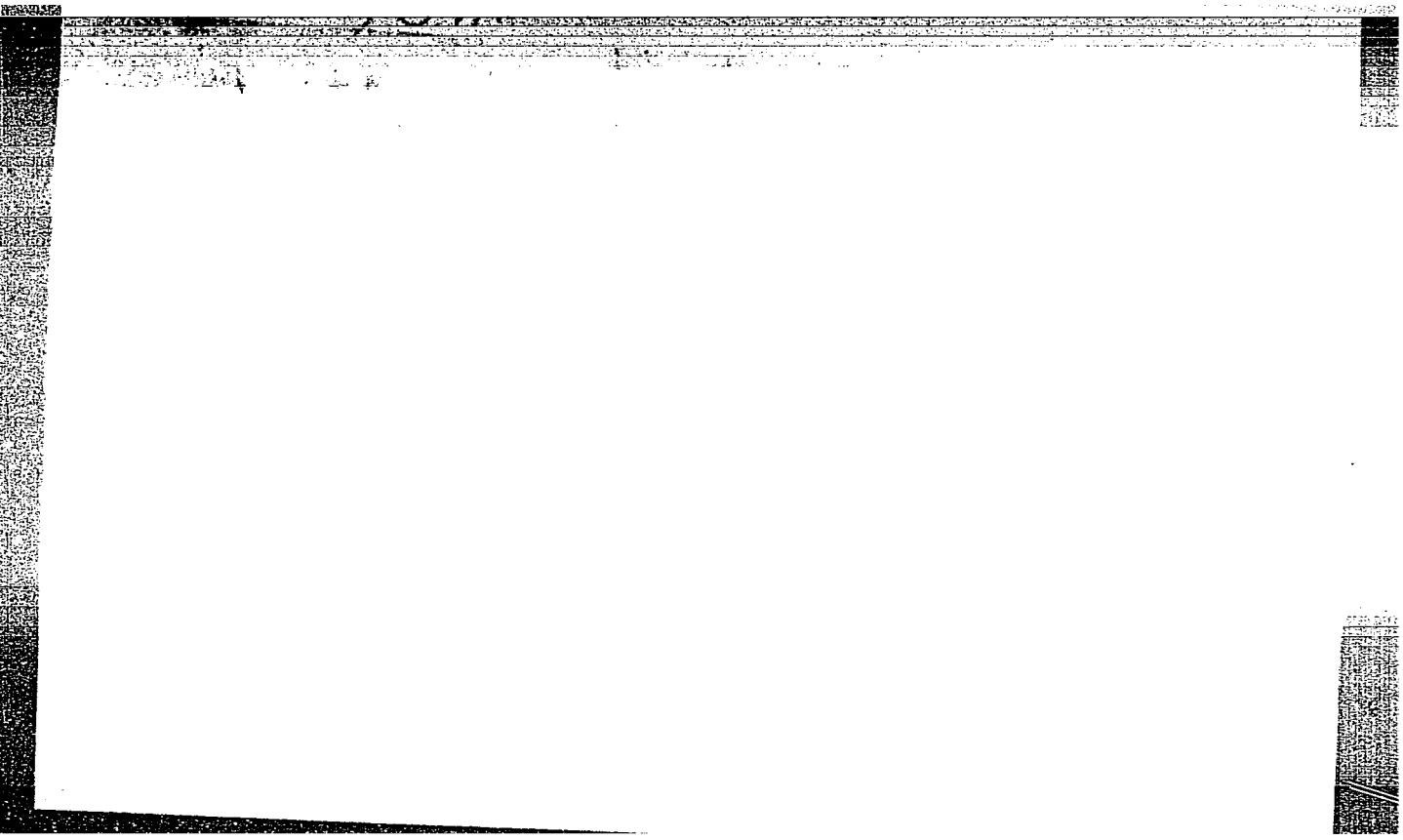

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The Influence of Swelling on the Production of Heat and the Fatigue Resistance of Vulcanized Rubber

production of heat in deformation stresses as well as the fatigue resistance. Swell experiments on a polymer based upon smoked sheets were carried out and it was found that a swelling in paraffin oil leads to a reduction of the production of deformation heat. Measurements of the coefficient of the mechanical losses in connection with the increase of the swelling degree were carried out by an apparatus according to Kornfel'd (reference 9). In experiments which were carried out by swelling of filled and unfilled natural rubber vulcanizates with paraffin oil and dibutylphthalate in a tester according to V. E. Gul' (references 7, 10) it was found that the fatigue resistance varies irregularly with the swelling degree. A decrease of the stability of the vulcanizate is observed in the case of more intensive swelling. The greater influence of dibutylphthalate (greater than that of Vaseline oil) is explained by the presence of polar and nonpolar domains. The necessity of the addition of a plasticizer to vulcanizates is determined in connection with the obtained investigation results. Investigations were carried out on the influence of mineral oil on the rubber properties

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The Influence of Swelling on the Production of Heat and the Fatigue Resistance of Vulcanized Rubber

in connection with the widely spread, of lately, "oil rubber" (a mixture of butydienestyrene rubber and mineral oils). Among other facts it was found that the addition of greater quantities of oil increases the fatigue resistance at normal and at increased temperatures. There are 11 figures, 3 tables, and 18 references, 16 of which are Slavic.

AVAILABLE: Library of Congress

1. Vulcanizates-Physical properties
2. Vulcanizates-Fatigue-Analysis
3. Vulcanizates-Temperature factors
4. Vulcanizates-Deformation-Test results

Card 3/3

DOGADKIN, B.A.

62[illegible]-3/8

AUTHORS: Pechkovskaya, K. A., Gol'dman, E. I, Dogadkin, B. A.

TITLE: Structure and Properties of Rubber Mixtures Containing Fillers. (Struktura i svoystva napolnennykh rezinovykh smesey). Part 17. Properties of Colloidal Silicic Acid, Defining its Strengthening Effect. (Soobshcheniye XVII. Svoystva kolloidnoy kremnekisloty, opredelyayushchiye eye usilivayushchiy effekt.)

PERIODICAL: Kauchuk i Rezina, 1958, Nr.2. pp. 12 - 17. (USSR).

ABSTRACT: A detailed investigation of samples of colloidal silicic acid of varying activity was carried out. Electron - microscopic investigations were made to determine the degree of dispersion. Figs. 1 and 2 show micro-photographs of active (strengthening the rubber) and inactive (having only a slight strengthening effect on the rubber) samples; the size of the particles was approximately 150 - 300 Å. The optical density of aqueous suspensions was determined, and it was found that the light absorption in suspensions containing active silicic acid, equal weight concentration, was twice as large as the light absorption in suspensions containing the inactive sample (Table 1). The dispersion of active and inactive modifications of colloidal silicic acid in Na - butadiene rubber was evaluated by microscopic analysis.

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Structure and Properties of Rubber Mixtures Containing Fillers. Part 17. Properties of Colloidal Silicic Acid, Defining its Strengthening Effect.

and by adding colouring agents. Figs. 3 and 4: micro-photographs of rubber mixtures containing inactive/active silicic acid. Surface properties of the filler are determined by the nature of the filler itself, and by the by-products adsorbed on the surface of the particles. It was, therefore, necessary to determine to what degree the activity of the colloidal silicic acid and of the filler depends on the adsorbed substances. Such admixtures are electrolytes which were separated by high voltage dialysis. Results of this purification are given in Table 2; they show that the separation of adsorbed admixtures with active colloidal silicic acid do not lead to deactivation. The electrical properties of the samples of colloidal silicic acid, with a varying degree of activity, were determined by electrophoresis on an apparatus designed by S. Rabinovich and E. F. Dimar. The experiments were carried out on suspensions of silicic acid in an aqueous solution of glycerine, the concentration = 2.4 g/l. Some admixtures can be separated at increased temperatures, e.g. the samples of active colloidal silicic acid were heated in a muffle

Structure and Properties of Rubber Mixtures Containing Fillers. Part 17. Properties of Colloidal Silicic Acid, Defining its Strengthening Effect.

furnace at 400° and 600°C during 3½-4 hours. After calcination, the material was tested in three component and in standard rubber mixtures. Table 3: the coefficient of alkalisation and physico-mechanical properties of the rubbers containing silicic acid before and after calcination. The kinetics of solubility of active and inactive industrial and dialysed colloidal silicic acid in a 1% solution of NaOH at various temperatures was investigated (Figs. 5 and 6). The industrial active sample dissolves in alkali at all investigated temperatures slower than the inactive. The opposite phenomenon was observed in the case of the active electro-dialysed purified sample. This can be explained by the very high surface activity of the first modification. There are 6 Figures, 2 Tables and 5 References: 3 Russian, 1 English and 1 German.

ASSOCIATION: Research Institute of the Tire Industry. (Nauchno-issledovatel'skiy institut shinnoy promyshlennosti)

AVAILABLE: Library of Congress.

Card 3/3 1. Synthetic rubber-Test results 2. Synthetic rubber-Mechanical properties 3. Silicic acid

SOV/138-58-5-4/9

AUTHORS: Tarasova, Z.N.,
Kaplunov, M.Ya.,
Dogadkin, B.A.,
Karpov, V.L.
Breger, A.Kh.,

TITLE: Vulcanisation by Nuclear Radiation (Vulkanizatsiya pod vozdeystviyem yadernykh izlucheniy)

PERIODICAL: Kauchuk i Rezina, 1958, Nr 5, pp 14-21 (USSR)

ABSTRACT: During recent years it was found that polymeric materials undergo deep structural changes when irradiated with high energy rays (x-rays and nuclear radiation). Investigations on the vulcanisation of rubbers and rubber mixtures by radioactive irradiation were carried out (Refs.1-7). This method of vulcanisation is called "radiation" vulcanisation. The authors investigated the structure and the properties of radiation vulcanisates obtained by irradiating rubbers and their mixtures in an atomic reactor and by gamma radiation from Co^{60}. They also determined the conditions for preparing the homogeneous

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Vulcanisation by Nuclear Radiation

solid and multi-layer articles (tyres) by the action of nuclear radiation. The following rubbers were tested: natural, butadiene-styrene SKS-30A and SKS-30AM, isoprene SKI and sodium-butadiene SKB. The rubbers were vulcanised in thin layers in steel or aluminium moulds. The degree of cross-linking of the molecular chains of rubber during irradiation vulcanisation depends on the admixtures in the rubber and on the molecular weight of the rubber and is also affected by the presence of oxygen. The influence of the medium in which radiation takes place on the degree of structure formation of purified natural rubber during radiation vulcanisation is shown graphically in Fig.1; the influence of the medium on the kinetic formation of cross-links during radiation vulcanisation is tabulated (Table 1). On studying the infra-red spectra it was noted that the presence of phenyl-B-naphthylamine strongly inhibited the oxidation processes during irradiation. Spectra of electron paramagnetic resonance showed that samples of SKS-30AM irradiated on air had increased

content of free radicals (Table 3). The effect of anti-oxidants on the properties of radiation vulcanisates is due, to a considerable extent, to the decreased number of double bonds in the presence of anti-oxidants. Fig.2: the relaxation of tension of rubbers subjected to radiation vulcanisation in air; Fig.3: the dependence of the constant of the rate of relaxation of the above vulcanisates on the number of cross-links. Due to the high power of penetration of nuclear rays, uniform vulcanisation is achieved throughout the sample (Table 4). The thickness of the vulcanising grate is defined by the dosage of absorbed energy, by the type and composition of the rubber, by the amount of fillers, plasticisers and anti-oxidants in the mixture and the conditions of irradiation as well as by some other factors. The radiation vulcanisates show thermo-mechanical stability surpassing the stability of vulcanisates containing thiuram. Activated carbon decreases the rate of chemical relaxation of radiation vulcanisates.

Vulcanisation by Nuclear Radiation

During the irradiation of purified rubbers intense oxidation occurs; this leads to complete loss of unsaturation when the dosage of irradiation = 60 mega roentgen. In this case the amount of double bonds is decreased to 30%. Conditions for preparing homogeneous vulcanisation grates were found to be independent from the thickness of the samples (within the limits of 0.1 - 40 mm). The physico-mechanical and technological properties of rubbers prepared by vulcanisation radiation were tested (Table 5). It was found that these vulcanisates were more resistant to thermo-oxidative ageing than sulphur-vulcanisates (4 - 5 times at 130° C), undergo small residual deformation, show low hysteresis and high recovery when subjected to repeated deformation. The vulcanisation of model tyre casings 7.50 x 20, 1/5th natural size, was carried out (Fig.8). Changes in the physico-mechanical characteristics of various tyre cords during irradiation in an atomic reactor are given in Table 7. Members of the Institute

Vulcanisation by Nuclear Radiation

im. L.Ya Karpov: V.B.Osipov, V.A.Gol'din, V.S.Pokrovskiy and V.P.Afonin assisted during these experiments. There are 8 figures, 7 tables and 14 references of which 10 are English and 4 Soviet.

ASSOCIATION: Nauchno-issledovatel'skiy institut shinnoy promyshlennosti (Scientific-Research Institute for the Tire Industry)